Introduction

Welcome to Linux! You hold in your hands everything you need to install and use one of the most powerful computer operating systems in the world. This book is designed to help guide you through the process of learning about Linux. To make the task even easier, this book uses one of the best Linux distributions on the market today—OpenLinux from Caldera Systems, Inc.

Although the title of this book is *Teach Yourself Linux in 24 Hours*, you won't be alone while you learn. As you're taken from installation through system administration to playing games, you'll find advice, tips, and hints to help you along the way. Before you know it, you'll be familiar with the terms, topics, and technical concepts dealing with the hottest and newest operating system in the world—Linux!

Teach Yourself Linux in 24 Hours is designed to help you learn quickly. You'll find it an indispensable guide to installing Linux and getting right to work. This helps you overcome technical obstacles, explains complex subjects in simple language, and shows you some neat tricks to make your computing experience easier.

Each section of this book gives you an hour's worth of knowledge and examples you can run as you learn. By the way, this book was created, developed, and edited using the software included on the book's CD-ROM. I hope you enjoy teaching yourself Linux!

What is Linux?

Linux (pronounced lih-nuks) is a UNIX-like operating system that runs on many different computers. Although many people might refer to Linux as the operating system and included software, strictly speaking, Linux is the operating system *kernel*, which comes with a *distribution* of software. The Linux distribution included with this book is Caldera Systems, Inc. OpenLinux and features special software not included with other distributions (see the section "What's Included on the CD-ROM?" later in the "Introduction").

Linux was first released in 1991 by its author, Linus Torvalds, at the University of Helsinki. Since then, it has grown tremendously in popularity as programmers around the world embraced his project of building a free operating system, adding features, and fixing problems.

Linux is popular with today's generation of computer users for the same reasons early versions of the UNIX operating system enticed fans more than 20 years ago. Linux is portable, which means you'll find versions running on name-brand or clone PCs, Apple Macintoshes, Sun workstations, or Alpha-based computers. Linux also comes with

source code, so you can change or customize the software to adapt to your needs. Finally, Linux is a great operating system that is rich in features adopted from other versions of UNIX. Soon you'll become a fan, too!

Why Teach Yourself Linux?

You should teach yourself Linux for a number of good reasons. You'll expand your knowledge of your computer's hardware, which can be handy in troubleshooting problems. You'll also learn the basics of using a UNIX-like operating system loaded with state-of-the-art features. When you combine this knowledge of hardware and software, you'll be well on your way to becoming a "power" computer user.

Use this book as a starting point in learning Linux basics. You'll learn all the skills you need to build and run a powerful and productive Linux workstation. Although you won't learn how to program in Java, administer a wide-area network, or manage a Web server, you will learn these things:

- Using Linux is a great way to connect to the Internet for emailing, file downloading, or World Wide Web browsing.
- You can get to work right away, as this book's Linux distribution (on CD-ROM) comes with a rich assortment of popular productivity tools, such as word processors, calendars, emailers, or graphics programs. More than 2,000 programs are included!
- You can have fun with some wacky arcade games.
- In no time at all, you'll be on your way to joining the worldwide community of Linux users.

Who is This Book For?

This book is for someone who wants to quickly master the basics of how to install, run, and maintain Linux on an Intel-based personal computer. All the tools you need are included.

Your computer should have a monitor (display), keyboard, mouse, hard drive, floppy drive, and CD-ROM drive. Although you can jump right in and install Linux on your hard drive, you should have some technical information about your computer and its hardware on hand before you start.

What's Included on the CD-ROM?

Everything you need! Included with this book is a CD-ROM from Caldera Systems, Inc. containing the latest and one of the most popular distributions of Linux—OpenLinux. This distribution includes the Linux kernel, more than 2,000 programs, and nearly 20,000 pages of documentation. As you read through this book and install or configure software, you'll see Caldera's OpenLinux distribution was chosen to help you learn. Some of its advantages are:

- OpenLinux is easy to install.
- OpenLinux uses a convenient software management system based on packages and includes several programs to help you add or remove software.
- OpenLinux includes the K Desktop Environment for the X Window System and has been specially configured to work "out of the box" so you can get to work right away.
- OpenLinux includes the highly popular StarOffice office suite of programs for word processing, graphics presentations, and spreadsheet forecasting.
- OpenLinux uses graphic tools to help you administer and maintain your system.
- OpenLinux software updates, patches, and bug fixes are available for free on the Internet through Caldera System's FTP and Web site.

How to Use This Book

This book is designed to teach you the latest version of the Caldera OpenLinux operating system in 24 one-hour sessions. You will learn how to install OpenLinux on your computer, how to use the Linux commands, how to use various windowing systems with OpenLinux, how to connect to the Internet, and how to use Linux to increase your productivity.

Each hour, or session, starts with an overview of the topic to inform you of what to expect in each lesson. This overview helps you determine the nature of the lesson and whether the lesson is relevant to your current needs.

Each lesson has a main section that discusses the lesson topic in a clear, concise manner by breaking the topic down into logical component parts and explaining each component clearly.

Interspersed in each lesson are special elements, called Tips, Cautions, and Notes, that provide additional information.

A *Tip* informs you of a trick or element that is easily missed by most new Linux users. Feel free to skip these hints and additions; however, if you skip reading them, you might miss a shorter or more efficient way to accomplish a task described in the main text.

A *Caution* deserves at least as much attention as the body of the lesson, because these point out a problematic element of the operating system or a "gotcha" you want to avoid while using the operating system. Ignoring the information contained in a Caution could have adverse effects on the stability of your computer. Be careful to read every Caution you run across.

A Note is designed to clarify the concept being discussed. Notes also contain additional information that might be slightly off-topic but interesting nonetheless. Notes elaborate on the subject, and if you're comfortable with your understanding of the subject, you can read these to add to your knowledge or bypass them with no danger.

Each lesson concludes with a Summary of what you have just learned, a Q&A section that answers the questions users new to Linux most frequently ask about that particular lesson's subject, and a Workshop containing exercises that will advance the reader in a further, hands-on study of that lesson's topic.

PART I

Installation and Configuration

Hour

1 Preparing to Install Linux

2 Installing Linux

3 Post-Installation Issues

HOUR 1

Preparing to Install Linux

Welcome to the wonderful world of Linux! This hour is the best place to start reading *before* attempting to install OpenLinux. There are several good reasons, especially for new Linux users, to sit down, take a deep breath, relax, and collect some thoughts before jumping into an installation.

Intrepid or experienced Linux users, such as those migrating from other distributions and installations such as Red Hat, Debian, or S.U.S.E. might feel tempted to rip the CD-ROM out of the back of this book and launch the installation. Hey, go for it! The CD-ROM boots, and you can easily use your existing Linux partitions. I think you'll be quite pleased with the treasure trove of software and the carefully crafted Caldera configuration of Linux.

For those of you coming into the light from the Dark Side—welcome! Consider some of the topics covered in this hour:

- What is Linux? (Or what isn't it?)
- What is OpenLinux? (And how is it different from other Linux distributions?)
- What equipment is required? (Do I have everything?)

- What equipment is supported? (Will my stuff work?)
- What equipment doesn't work? (Uh oh! What am I going to miss?)
- What equipment do I have? (Do I know about my computer?)
- How do I plan for the installation? (What do I need to know?)
- How is Linux installed? (Count me the ways!)
- How do I plan to boot OpenLinux? (How can I boot Linux?)

After these introductory sections, you then get directions on how to prepare your hard drive for OpenLinux. So, if you're an experienced user, skip this hour. Heck, you can skip the next two hours! But if you want to know a little more about Linux and how OpenLinux is different, read on! First-time Linux installers and users definitely need to read what follows.

What is Linux?

NEW TERM Linux is the *kernel* of an operating system that runs on many different types of computers. This is the core piece of software that provides an interface between the command line or program and your computer's hardware. The Linux kernel manages such things as memory, how and when files are opened or closed, and what *process*, or program, has the full attention of your computer's Central Processing Unit (CPU).

Linux, a clone of the UNIX operating system, was first released on October 5, 1991 by its author, Linus Torvalds, at the University of Helsinki. Linux supports all the features of a modern operating system, including (but not limited to) the following:

- All major networking protocols
- Disk quota support
- Full source code
- Internationalization for fonts and keyboards
- Job control
- Math co-processor emulation
- Memory protection
- Multiple platforms
- Multiple processors
- Multiple users
- Multitasking
- Shared libraries

- Support for more than a dozen filesystems
- Virtual consoles
- Virtual memory

Linux is distributed as copyrighted software, or, because it is under the GNU General Public License (GPL), "copyleft" software. Basically, this license states that you can modify or give away copies of Linux, even sell it for profit, as long as you recognize the original author(s)' copyright and provide the source code.

Not all the software included on this book's CD-ROM is distributed under the GNU GPL. Always read any COPYRIGHT or LICENSE file included with a program. For more information about the GNU GPL, browse to: `http://www.fsf.org/copyleft/gpl.html`.

Linux inherits more than 25 years of UNIX experience, source code, and support. This makes Linux, even though one of the newest operating systems, far more mature than current commercial offerings. Linux is also a bargain. You have to spend nearly $5,000 for a 50-user license for Windows NT at the time of this writing, whereas you can get much more (including more than 1,000 programs) from Linux for the cost of this book.

There are versions of Linux for computers not based on the Intel chip, such as those from Sun Microsystems (SPARC) or computers using other central processing units (CPUs), such as the Alpha chip. To read more about other distributions of Linux for computers besides those based on the x86 architecture, browse to `http://metalab.unc.edu/LDP`.

Linux is not shareware. Linux is not in the public domain. Linux is not a "toy" operating system suitable only for longhaired hackers. Linux is a viable, alternative platform for high-end network server operations as well as a desktop operating system.

What is OpenLinux?

NEW TERM OpenLinux is a Linux *distribution*, or collection of specially tweaked software, configuration files, and utilities, pressed on a CD-ROM by Caldera Systems, Inc. You can find a CD-ROM chock-full of software in the back of this book that contains everything you need to start teaching yourself Linux.

Caldera Systems, Inc. (derived from its parent company, Caldera, Inc.) first produced a Linux distribution in 1994. The OpenLinux distribution has several features not provided in other distributions, such as Est, Inc.'s BRU-2000 backup and restore client, DR-DOS, NetWare 3.x and 4.x utilities, the NetWare NDS client, Corel's WordPerfect 8 for Linux, and the latest StarOffice office suite. Caldera also preconfigured the desktop panel of the K Desktop Environment to work specifically with the programs installed from this book's CD-ROM.

BRU-2000 and StarOffice 5.0 are not actually included in the version of OpenLinux 2.2 included on the CD-ROM for the book, both both are available for free download from the Web.

Another outstanding feature of this Linux distribution is that Caldera has made the process of installing Linux easier than ever by including limited editions of Power Quest's PartitionMagic and Boot Magic on the CD-ROM. You'll be pleasantly surprised!

What Equipment is Required?

If you can run DOS or Windows on your computer, you can probably install and run OpenLinux. The general requirements for installing OpenLinux are the following:

- 386 or better equivalent CPU
- 16 megabytes of random access memory (RAM)—although Linux can work with 8 megabytes (32 is the recommended minimum when using StarOffice)
- 1.44MB 3.5 inch floppy drive
- CD-ROM drive
- Minimum of 300 megabytes to one gigabyte of hard drive space for a complete installation of the contents of this book's CD-ROM

What Equipment is Supported?

The best and definitive place to check what computer hardware is supported out of the box by OpenLinux is at this site:

`http://www.calderasystems.com/products/openlinux/hardware.html`

There are listings of supported hard disk and CD-ROM drive interfaces (such as IDE, XT, or SCSI), parallel-port CD-ROM drives, supported serial boards, mouse pointing devices (rodentiometers), tape drives, networking cards, and PCMCIA cards.

Video cards, or video chipsets for laptop users, are listed under the `/usr/X11R6/lib/X11/doc` directory after you install OpenLinux and the X Window System. To read an online list of supported cards for X11 (and which X11 server to use), browse to this site:

`http://www.xfree86.org/cardlist.html`

Laptop users definitely need to browse the Linux Laptop Pages. There are specific directions on how to install and configure Linux and X11 for your laptop. Look for your laptop model listed at this site:

`http://www.cs.utexas.edu/users/kharker/linux-laptop/`

What Equipment Doesn't Work?

With the explosion of the personal computer market in the last few years, more and more homes and businesses are either buying computers for the first time or upgrading older computers. Believe it or not, you'll probably have fewer problems installing Linux with one- to three-year-old hardware than if you're on the latest and greatest PC. This is because although Linux is supported by the efforts of programmers around the world, not many PC manufacturers support Linux (yet!) by releasing the specifications of their hardware. Without these techincal details, programmers can have a difficult time writing software. If your computer's hardware is not supported by Linux, complain to its manufacturer!

Fortunately, the list of unsupported hardware, or hardware with problems, is much smaller than supported hardware. For example, you might have trouble with older 486-based AMD CPUs, older Cyrix CPUs, and Microchannel-based PCs. There is little support for parallel-port tape drives and some Xircom ethernet cards with the current Linux software.

Winprinters

Winprinters, or printers that depend on operating system-specific drivers, such as the Hewlett-Packard 710, 720, 820, and 1000-series printers, are not supported by software included on this book's CD-ROM. However, you can find support for some of these printers through the use of special software, located at this site:

`http://www.rpi.edu/~normat/technical/ppa`

Other problems crop up with printing support for Epson Stylus color printers. You can find some answers from Caldera at the following site:

`http://www.calderasystems.com/support/techguide/styluscolor.html`

Winmodems

Winmodems (part of a disgusting recent trend by PC and laptop manufacturers trying to save a few pennies per unit) are operating system-specific and will probably never be supported by Linux. These modems, which use less hardware than "real" modems, work through the use of software drivers (it's cheaper to offload all the work on your computer's CPU; besides, if you use Windows 9x, you're only doing one thing at a time anyway, right?). If you buy a PC or laptop with one of these modems, you're at the mercy of the manufacturer whether the modem is supported in the future or whether it works with another operating system.

Beware! Many manufacturers tout these modems as "56K ITU V.90 modems," but fail to mention they are winmodems. Ask if the modem can be used with DR-DOS, PCDOS, or MSDOS. If not, it's a winmodem. To be safe, buy an external modem that can be used with any computer operating system.

Infrared Ports

Although software to support your computer's infrared port isn't included on this book's CD-ROM, the good news is that there is full infrared support for OpenLinux. This means that if you have a laptop or desktop with an IR port, you can now network, print to an IR printer (such as an HP 340Cbi or Canon BJC80), and even transfer or back up your 3Com Palm PDA without cables! Browse to this site:

```
http://www.cs.uit.no/~dagb/irda/irda.html
```

There are directions on how to download, install, and configure IR support for Linux. For complete directions in a HOWTO document format, browse to this site:

```
http://www.userpage.fu-berlin.de/~r2d2c3po/ir_howto.cgi
```

If you own a 3Com Palm Pilot Professional or Palm III, there are nearly two dozen Pilot support utilities included with OpenLinux. Kenneth Albanowski's `pilot-xfer` command makes backing up a Palm III as easy as this:

```
pilot-xfer /dev/pilot –b pilotbackupdirectory
```

If you use KDE, use the Kpilot client, installed from the `/col/install/RPMS` directory on your OpenLinux CD-ROM. This is a graphical interface to administering your Palm computer.

What Equipment Do I Have?

You need to know a little about your computer before installing OpenLinux. Get out your paper and pencil, and then fill out as much information as you can in this section's following checklist. If your PC or laptop manufacturer didn't document all the technical details of your computer, you might have to browse the manufacturer's Web site or call for the information.

- Type of CPU (386, and so on)
- Amount of system RAM (in megabytes)
- Total size of hard drive (in megabytes)
- Hard drive space needed for the Linux swap partition (twice the size of system memory, or your computer's RAM; see Hour 2, "Installing Linux")
- Size of hard drive you want for OpenLinux (in megabytes, depending on the type of installation; see Hour 2)
- Type of hard drive controller (for example, IDE/SCSI)
- Type of CD-ROM controller (for example, ATAPI)
- Number of serial ports (note: there is no Universal Serial Bus, or USB, support for Linux at the time of this writing)
- Type of keyboard (PS/2, most likely)
- Number of keys (101, 102, 104, and so on)
- Type of mouse (PS/2, serial, and so on)
- Infrared port (COM1–COM4, IRQs used, shared, and so on)
- Serial port assignments (COM1–COM4, IRQs used)
- Type of modem (Fax class support, such as Class 1, 2.0, voice, and so on)
- Parallel port assignment (0x378, IRQ 5, and so on)
- Model and type of printer (Epson, HP, PostScript, HPCL, and so on)
- PC cards used (modem, network, flash memory, and so on)
- Type of PCMCIA controller (TI, for example)
- Type of sound card (SoundBlaster, ESS, and so on)
- I/O address of sound card (such as 0x220)
- DMA values (0, 1, and so on)
- Sound card IRQ (such as 5 or 7)
- Miscellaneous addresses (such as for MPU)

- Type of graphics card (chipset used, such as TGUI9680, Cirrus Logic, ATI Rage II, and so on)
- Amount of video memory (1MB, 2MB, 4MB, and so on)
- Color depth capability (256, 16-bit, 24-bit, and so on)
- Monitor Horizontal Refresh (such as 31.5–60, 31.4, and so on)
- Monitor Vertical Refresh (70–100, for example)
- Monitor Maximum Resolution (800×600, 1024×768, 1280×1024, and so on)

You might not need all this information to install OpenLinux, but sooner or later these details come in handy when you install PC cards, set up sound, or configure X11.

How Do I Plan for the Installation?

Many new OpenLinux users easily install Linux by themselves. If you experience a problem, don't be disappointed, and don't give up! Here are the four basic hurdles to a successful OpenLinux installation:

1. Partitioning the hard drive—This is one of the reasons many people think Linux is hard to install. How many computer users today have partitioned a hard drive or even installed an operating system? Don't be intimidated by this step, which merely makes room for OpenLinux on your hard drive. Just make sure to back up important documents or files before you begin. See Table 1.1 for the size requirements of different installations, and then write down your requirements. Many experienced OpenLinux users don't bother with this step at all and simply install Linux as the sole operating system. Installing Linux is a breeze if you don't have to deal with creating or resizing hard drive partitions.

TABLE 1.1 CALDERA OPENLINUX INSTALLATION REQUIREMENTS

Size in Megabytes	*Installation Description*
300	Small system (with X11 and KDE) with programs suitable to use your computer as a server
500	Standard system (the default); includes development tools and other programs suitable for a server and workstation
1024	Full installation (everything)

2. Configuring the X Window System—X11 is the default graphical interface for OpenLinux—but it is *not* Linux. X runs on many different types of computers and operating systems, which is why there is such a wealth of graphical programs for Linux. You have a better chance of configuring X11 to work with your graphics hardware if you have a graphics card that's been on the market for at least two years. You'll configure X11 during your OpenLinux installation. Details about configuring X can be found under the `/usr/X11R6/lib/X11/doc` directory after OpenLinux is installed.
3. Configuring sound—OpenLinux comes with loadable code modules you can use to get sound working, or you can recompile the Linux kernel to work with your sound card (some details can be found at `http://www.calderasystems.com/support/techguide.html`). If you don't want to hassle with kernel modules or rebuilds, browse to `http://www.4front-tech.com/oss.html`, and download an evaluation copy of the Open Sound System drivers. This inexpensive set of sound drivers supports hundreds of different sound systems. Using OSS is one of the easiest ways to configure sound cards for Linux. See Hour 20, "Relaxation and Playing Linux Games," for tips on configuring OpenLinux for sound.
4. Getting connected—Connecting to the Internet using OpenLinux is an important step. To make the job of connecting to the Internet easier, use the Red Hat `netcfg` tool, the `kppp` client, or the `xisp` client to set up your account. Make sure to read the PPP HOWTO and ISP Hookup HOWTO under the `/usr/doc/HOWTO` directory if you have trouble. Hour 9, "Using Communications Programs," has the details about using a modem with OpenLinux. See Hour 10, "Connecting to the Internet," for information about how to establish a PPP connection.

You next have to decide how to install OpenLinux. I don't cover installing Linux using a network or a Parallel Line (PLIP) interface (for details about these methods, see `http://www.calderasystems.com/support/techguide.html`).

Booting the Install from CD-ROM

The easiest way to install OpenLinux is to insert the OpenLinux CD-ROM in your computer, reboot, and follow the prompts. Booting from a CD-ROM drive might require you to reset your computer's BIOS to change the order of boot disk recognition (usually done by pressing a particular F key (or key sequence) after starting your computer—see your computer's manual for details).

Booting the Install from Floppies

You can create a boot floppy diskette, then insert your OpenLinux CD-ROM, and boot from your floppy to start an installation. The easiest way to create a boot floppy is to install the OpenLinux utilities under Windows (see this chapter's later section "Preparing Your Hard Drive from Windows"). You can then click on the Create Install Diskette icon in the OpenLinux program folder on your Start menu.

You can also use the `RAWRITE3.COM` program under DOS to create the floppy if you cannot boot the OpenLinux CD-ROM. First, note the drive letter (such as `D` or `E`) for your CD-ROM. To create a boot floppy, do the following:

1. Insert the OpenLinux CD-ROM, and then reboot to DOS. At the DOS command line, type the drive letter of your CD-ROM, change the directory to the `\col\launch\floppy` directory, and start the `RAWRITE3` command like this:

   ```
   D:
   CD \COL\LAUNCH\FLOPPY
   RAWRITE3
   ```

2. After the `RAWRITE3` program starts, it asks you to enter the source file name. Type **`INSTALL.144`**, and press Enter.
3. `RAWRITE3` then asks you to enter the destination drive (`A` or `B`); type the drive letter of your floppy, such as **`A`**, and press Enter.
4. `RAWRITE3` then asks you to install the target diskette in the disk drive. Insert a blank diskette into your drive, and press Enter.
5. `RAWRITE3` copies the file `INSTALL.144` to your floppy.
6. When you finish, remove and label the diskette.

If you have a PCMCIA CD-ROM drive or need other specialized support, repeat the preceding steps with a separate floppy, but use `MODULES.144` instead of `INSTALL.144`. This creates a second disk with software you need to help OpenLinux recognize your external CD-ROM or PC cards during the first installation steps.

Label and keep your boot floppies in a safe place. You'll need them (if you don't boot from CD-ROM) in Hour 2.

Other Ways

A number of hardware vendors also offer Linux preinstalled on a new hard drive, laptop, or computer. If you want a computer completely configured out of the box, this is the way to go. Browse to `http://metalab.unc.edu/LDP/HOWTO/VAR-HOWTO.html`.

You can always ask a friend with Linux experience to come over and install OpenLinux for you! This is a great way to share information, and having someone on hand to help can make the installation process easier. Alternatively, go to a Linux User Group (LUG) InstallFest! Browse to `http://www.linux.org/users/index.html` to find a LUG near you. LUGs regularly hold installation meetings, and you can have OpenLinux installed and configured in no time at all!

Planning Your Boot Process

There are many different ways to start Linux. You have to decide whether you want to start Linux from a boot prompt, a command line in DOS, from floppy diskette, or a commercial software program.

1. LILO—The Linux loader (LILO) is a small program used to jumpstart Linux or other operating systems. You can install LILO in the Master Boot Record of a DOS partition or in the root partition of a Linux partition on your hard drive directly after the install process.

Install OpenLinux and LILO after you have installed Windows. With typical disregard, other operating system installs wipe out LILO (although it can be restored by booting with a Linux boot diskette and rerunning the `lilo` command found under the `/sbin` directory.

2. `LOADLIN.EXE`—Use the LOADLIN program from DOS to boot Linux. You do not have to install LILO if you use this program. You need to copy the Linux kernel onto a DOS partition or floppy. Booting from DOS has the advantage of enabling certain hardware (such as an Mwave adapter) to work with OpenLinux.
3. Boot diskette—A boot diskette can also be used to start Linux. You can save LILO on a diskette and then boot Linux, DOS, or other operating systems.

4. Floppy—Want to try Linux from a floppy before installing OpenLinux? Browse to `http://metalab.unc.edu/LDP/devel.html` and search for Linux distributions that fit on a floppy. You can boot to Linux with a single floppy (but you don't get the X Window System).
5. System Commander—This is a commercial program you can use to boot multiple operating systems. Browse to `http://www.systemcommander.com` for details.
6. BootMagic—Included with PowerQuest Corp.'s PartitionMagic, BootMagic can be used to boot multiple operating systems, such as Windows NT and IBM's OS2. The commercial version of PartitionMagic also includes a DOS utility named PQBoot, which lists active, bootable partitions and can be used to boot other operating systems, such as Linux. Browse to `http://www.powerquest.com` for details.

Preparing Your Hard Drive

NEW TERM The first step in the installation process (after making boot floppies, if needed) is to partition, or create room on your hard drive. If you only want to use OpenLinux on your computer, skip the rest of this hour and proceed directly to Hour 2. But if you want to use a *dual-boot* computer, or boot at least two different operating systems, you need to create a partition on your hard drive with enough room for your OpenLinux software.

NEW TERM Partitions are nothing more than a special way to look at a hard drive and how it is divided up. There are two types of partitions: *primary* and *extended*. Your hard drive can contain four primary partitions. If you need to further divide or map your hard drive, you can designate one of these primary partitions as an extended partition (which can then be divided up even more).

NEW TERM These partitions generally contain a *filesystem*. A filesystem is how files or directories are written to the hard drive. DOS and older versions of Windows use a filesystem called FAT16. Newer versions of Windows use FAT32. Linux uses two types of filesystems: ext2 (for storing files) and swap (for temporarily storing memory).

Fortunately, Caldera's OpenLinux CD-ROM contains everything you need to partition your hard drive for OpenLinux! This CD-ROM contains limited editions of PowerQuest's PartitionMagic and Boot Magic. You'll be able to set up your Linux partitions directly from Windows after you install these utilities (read on to learn how).

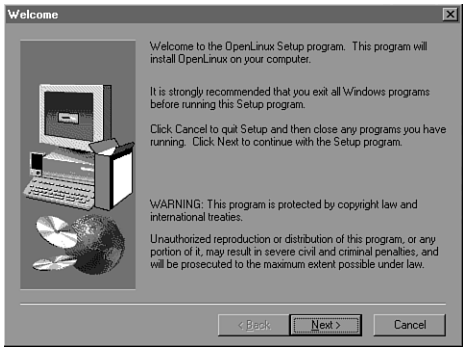
During the installation process, some laptop and desktop users might find a small partition used by the computer's BIOS for "Save to Disk" operations (such as putting the computer to sleep). This partition is generally the same size as the amount of system memory, or RAM, installed in your computer. Generally speaking, leave this partition alone. Also note that if you increase your computer's RAM, the partition might need to be resized to match the new size of internal memory (which could cause some interesting juggling or resizing of other partitions).

Preparing Your Hard Drive from Windows

The first step to preparing your hard drive to support booting Windows and OpenLinux is to install Caldera's and Power Quest's utilities. Start your computer. When the Windows desktop appears, insert your OpenLinux CD-ROM. The OpenLinux Welcome screen should appear, as shown in Figure 1.1.

FIGURE 1.1

The OpenLinux Welcome dialog box is the starting point for your OpenLinux adventure!

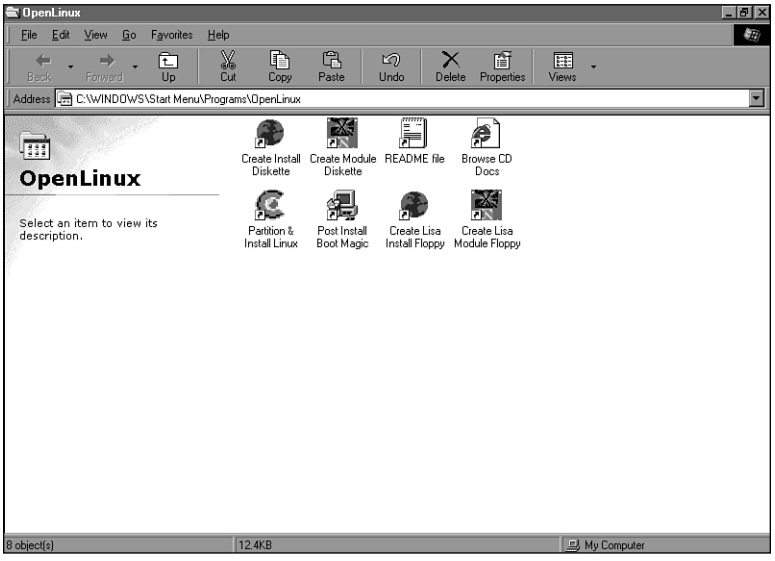

Welcome
Welcome to the OpenLinux Setup program. This program will install OpenLinux on your computer.
It is strongly recommended that you exit all Windows programs before running this Setup program.
Click Cancel to quit Setup and then close any programs you have running. Click Next to continue with the Setup program.
WARNING: This program is protected by copyright law and international treaties.
Unauthorized reproduction or distribution of this program, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under law.
< Back
Next >
Cancel

If the install process doesn't begin automatically, double-click your computer's CD-ROM icon under the My Computer folder.

Follow the prompts, and this setup procedure will create an OpenLinux program folder in your Start menu. This folder will contain Shortcuts to creating installation (boot) floppies, installing Boot Magic (to support booting Windows and Linux), and partitioning your hard drive and installing Linux. After the setup finishes, double-click the Partition and Install Linux icon (as shown in Figure 1.2).

FIGURE 1.2

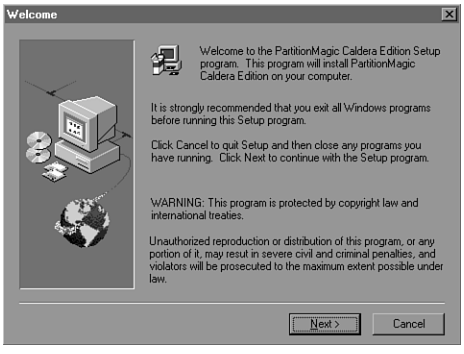
Double-click the Partition and Install Linux program to begin your installation.



This will start the PartitionMagic Caldera Edition setup program, as shown in Figure 1.3. Follow the prompts, and the setup will create a PowerQuest program folder on your hard drive. A PartitionMagic program folder for your Start menu will also be created.

FIGURE 1.3

To start your installation, you must first install the PartitionMagic Caldera Edition program.


Welcome
Welcome to the PartitionMagic Caldera Edition Setup program. This program will install PartitionMagic Caldera Edition on your computer.
It is strongly recommended that you exit all Windows programs before running this Setup program.
Click Cancel to quit Setup and then close any programs you have running. Click Next to continue with the Setup program.
WARNING: This program is protected by copyright law and international treaties.
Unauthorized reproduction or distribution of this program, or any portion of it, may resut in severe civil and criminal penalties, and violators will be prosecuted to the maximum extent possible under law.
Next >
Cancel

After the installation, the setup program will then ask you to click a Finish button. This will shut down Windows and run PartitionMagic. You'll be asked, as shown in Figure 1.4, to remove your OpenLinux CD-ROM before continuing. This is because you must first create your Linux partitions before you install Linux. (Your computer could reboot directly to installing OpenLinux if the CD-ROM is still inserted.)

FIGURE 1.4

Don't forget to remove your CD-ROM before continuing your installation!

Remove CD
Stop!
Please eject the CD tray and remove the CD before continuing.
Once the CD has been removed from the tray, click OK to continue.
OK

If you already have a Linux installation and use LILO, your computer will reboot to LILO at this point. To continue the installation, boot to Windows from LILO. However, the installation procedure will not recognize your existing Linux partitions. After you install OpenLinux, you'll find a Delete Linux icon in the PartitionMagic program folder you can use to delete Linux partitions. The best way to install OpenLinux on an existing Linux setup is to reboot and install OpenLinux using the installation floppies or directly from CD-ROM. See Hour 2, "Installing Linux," for details.

PartitionMagic Caldera Edition will only recognize your first hard drive and will only create three different sized partitions: 300 megabytes, 500 megabytes, and one gigabyte. When its dialog box appears, click the desired Linux partition size, and click the OK button. You then see PartitionMagic's dialog box, which shows the partitioning progress. After the partitioning is complete, insert your OpenLinux boot floppy diskette and/or your OpenLinux CD-ROM, and reboot your computer to start the installation.

If you want to use more hard drive space than the maximum one gigabyte afforded by the limited edition of PartitionMagic, boot directly to the OpenLinux installation with a boot floppy and/or the OpenLinux CD-ROM. During the initial installation, choose the Custom partitioning scheme. Note, however, that you must have an available existing or empty partition; this partition will be formatted for Linux.

Summary

This hour introduced you to some basic concepts about Linux, OpenLinux, and how to prepare for a Linux installation.

Q&A

Q I'm confused! What's the best way to install OpenLinux?

A Although it all depends on your computer's hardware and how you plan to use OpenLinux, the simplest, most direct way to install OpenLinux is to boot with the OpenLinux CD-ROM from the back of this book. You can overwrite any existing data and install OpenLinux as the primary operating system.

Q I want to use NT and OpenLinux! What do I do?

A Install NT first. But when installing OpenLinux, install LILO in the Linux root partition (see Hour 2).

Q I have the commercial version PartitionMagic. Can I use this program instead of the Caldera Edition?

A Yes. You'll have a bit more flexibility, as PartitionMagic can create any size partition from your existing hard drive space. Caldera included a special edition of PartitionMagic to make the job of making room on your hard drive a bit easier, but the commercial version of PartitionMagic offers many, many additional features.

Q I have 32 megabytes of RAM. How large of a swap space should I plan for? What's the largest swap space I can use?

A If you have 32 megabytes of RAM, plan on creating a 64-megabyte swap partition. In general, create a swap partition at least twice the amount of your computer's RAM (or larger if you plan to run memory-intensive programs, such as graphics editors).

Exercises

1. Create your OpenLinux installation boot floppies. Make sure to label them correctly.
2. Install OpenLinux and PowerQuest's Caldera Systems Edition PartitionMagic. Note which program folders are used for OpenLinux and PartitionMagic in your Start menu.
3. Sit down and calculate the amount of hard drive space you want to use with OpenLinux. Don't forget to include the swap space required!

HOUR 2

Installing Linux

This hour shows you how to install OpenLinux. At this point, you should know how much hard drive space you want to devote to OpenLinux. You should also have filled out the checklist presented in Hour 1, “Preparing to Install Linux,” and have this information on hand during and after the installation process. You also need the OpenLinux boot disks if your computer cannot boot from a CD-ROM drive. Take your time during the installation, and don’t proceed until you’re sure of the information presented in the installation dialog boxes.

If you’ve installed OpenLinux or other Linux distributions, be prepared for a pleasant surprise! The latest version of Caldera OpenLinux offers the fastest and easiest Linux installation ever! The folks at Caldera have made the chore of installing Linux a pleasant task with features such as the following:

- A complete graphical interface to the install process
- Point-and-click hard drive partitioning for experts
- Background installation of packages from CD-ROM while continuing the system configuration process

- Automatic detection of graphics cards for configuring the X Window System
- A pleasant diversion while the installation continues

You have backed up any important documents or files, right? Don't proceed to install OpenLinux unless you're absolutely sure you won't lose any important data. If you're installing OpenLinux on a brand new desktop or notebook computer, make sure you have a restore CD-ROM or have followed the manufacturer's recommendations on backing up critical device drivers. Granted, you might be able to get most of the important files from the manufacturer's Web site, but unfortunately, many computer manufacturers don't provide a restore CD-ROM and still require end users to back up included software to diskette. You have been warned!

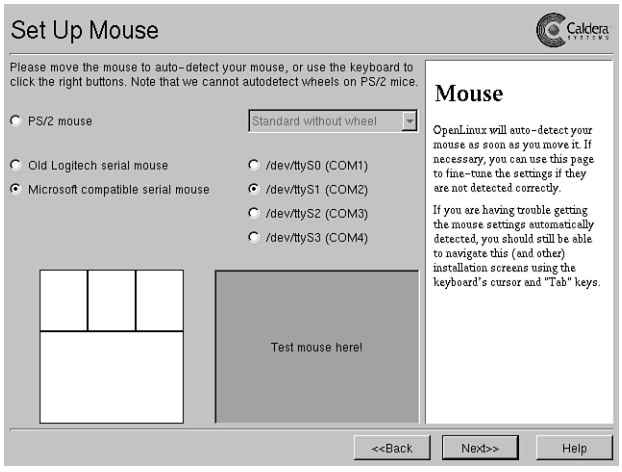
Beginning the Installation

Experienced installers might have skipped the installation instructions in Hour 1. If so, the first step is to set your computer to boot from its CD-ROM drive. This might require you to restart your computer and then press and hold down a function key during the restart to enter your computer's BIOS manager. Set your computer's BIOS to change the order of the recognized boot device so the CD-ROM drive is recognized first. You probably have to then save these changes and restart your computer. Then, do the following:

1. Insert the OpenLinux CD-ROM in your computer, and reboot.
2. If you followed the directions in Hour One and inserted your CD-ROM, when your computer restarts, you see Caldera's splash screen.
3. OpenLinux starts booting. You see various lines of technical information flash by on the screen as OpenLinux determines the various components installed on your computer (such as the hard drive, floppy, serial ports, keyboard, or CD-ROM) and attempts to load various software components.
4. At the dialog box Shown in Figure 2.1, click to select the type of mouse installed on your system. Test your mouse buttons by moving your cursor to the labeled test area and then clicking the left, right, or middle mouse buttons. When you finish, click the Next button.

FIGURE 2.1

OpenLinux should automatically detect your mouse, but you can use the Set Up Mouse dialog to test your mouse buttons.


Set Up Mouse
Caldera
Please move the mouse to auto-detect your mouse, or use the keyboard to click the right buttons. Note that we cannot autodetect wheels on PS/2 mice.
PS/2 mouse
Standard without wheel
Old Logitech serial mouse
Microsoft compatible serial mouse
/dev/ttyS0 (COM1)
/dev/ttyS1 (COM2)
/dev/ttyS2 (COM3)
/dev/ttyS3 (COM4)
Test mouse here!
Mouse
OpenLinux will auto-detect your mouse as soon as you move it. If necessary, you can use this page to fine-tune the settings if they are not detected correctly.
If you are having trouble getting the mouse settings automatically detected, you should still be able to navigate this (and other) installation screens using the keyboard's cursor and "Tab" keys.
<<Back
Next>>
Help

5. You're asked to select where Linux should be installed. If you partitioned your hard drive with Partition Magic, OpenLinux automatically highlights the Prepared Partitions button—click Next to continue. (Partition Magic will have automatically created a large, single Linux partition and a smaller Linux swap partition for the installation process.)

The Caldera Edition of Partition Magic implements a simple partitioning scheme using a single Linux native and a single swap partition. This is the easiest and fastest way to install OpenLinux, but it might not suit the needs of more advanced users. For a quick digression on partitioning, read Eric S. Raymond's Installation HOWTO (under the `/usr/doc/HOWTO` directory), especially Section 6.4, "Creating partitions for Linux."

If you'd rather use the entire hard drive, click Entire Hard disk to format and install Linux.

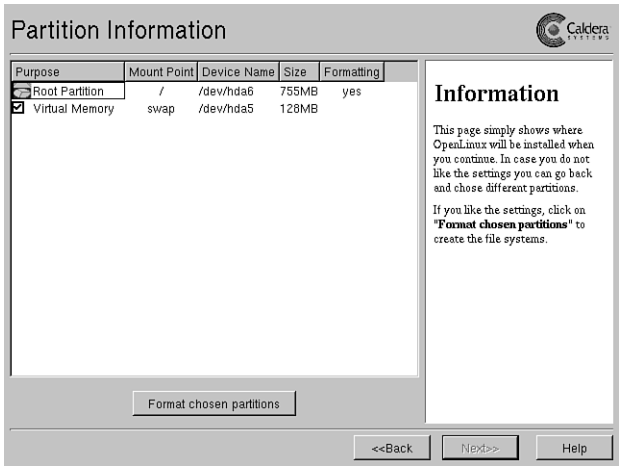
If you select Entire Hard disk, OpenLinux formats your entire drive. Make sure this is what you want to do! Always back up important information before installing Linux (or any other operating system)!

If you want to create several Linux partitions from an existing spare partition, click Custom (Expert only!), and click the Next button. You see a dialog box you can use to split up an existing partition to create different partitions for different parts of your OpenLinux installation (many experienced Linux users create separate partitions for programs, users, or temporary storage). Use the Custom (Expert only!) dialog box to create Linux partitions from existing Linux, Windows, or DOS hard drive partitions. By using the Edit button in the Expert mode, you can change the size of a partition and designate mounting points for Linux partitions. When you finish with the Expert mode, click the Write button to save your changes, and then click the Next button to continue.

6. OpenLinux now displays the Linux partition information, as shown in Figure 2.2. You should see at least one Root Partition (with a "/" Mount Point) and a Virtual Memory (or swap) partition. If you're satisfied, click the Format Chosen Partitions button to continue.

FIGURE 2.2

Format your Linux partitions prior to installing OpenLinux



7. OpenLinux now formats your new Linux partitions. When the formatting is finished, the Next button becomes active. Click Next to continue.

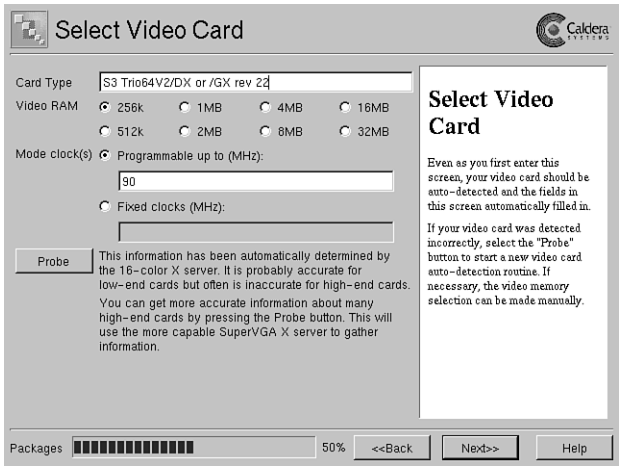
8. You're now asked to select an installation. There are four choices: a minimum set (about 300 megabytes for a server installation with the X Window System); all recommended packages (about 500 megabytes for a server and workstation installation with the X Window System and development packages); all recommended plus commercial packages; and all packages (about one gigabyte for a complete installation of all the software included on your CD-ROM). Click the desired package to install, and then click the Next button to continue.

OpenLinux doesn't enable you to try to choose an installation larger than the available space on your Linux partition. You have to choose a smaller installation. If you have the hard drive space, you can back through the installation dialog boxes by pressing the Back button to create a larger Linux partition or create additional Linux partitions later.

9. OpenLinux now shows a dialog box and asks you to select a keyboard model and layout. Scroll through the list of keyboards, and click your model. Next, select a keyboard layout (such as U.S. English). To test the selected keyboard, click in the Test here field and type some text. When you finish, click the Next button to continue. Also, note that the package installation continues copying files to your Linux partition while you continue the configuration process!
10. OpenLinux now asks you to select your video card, as shown in Figure 2.3. This is a critical step in the installation process and ensures that you'll be able to run the X Window System at the best possible resolution with your computer's video card and monitor. Look at the Card Type field to see if your computer's video card is correctly listed. Next, click the amount of video RAM installed on your video card (such as 2MB). Even if your video card is correctly listed, click the Probe button to get more accurate information. This runs the `XF86_SVGA` X11 server to probe your graphics card for setup information.

FIGURE 2.3

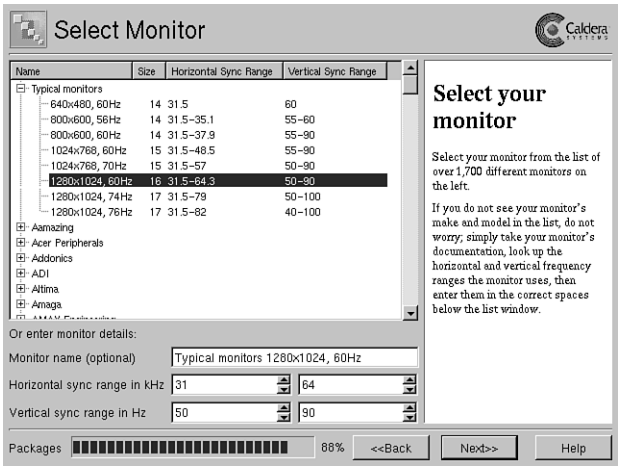
OpenLinux should automatically detect your video card, but you can click the Probe button to get a more specific setting.


Select Video Card
Caldera
Card Type
S3 Trio64V2/DX or /GX rev 22
Video RAM
256k
1MB
4MB
16MB
512k
2MB
8MB
32MB
Mode clock(s)
Programmable up to (MHz):
90
Fixed clocks (MHz):
Probe
This information has been automatically determined by the 16-color X server. It is probably accurate for low-end cards but often is inaccurate for high-end cards.
You can get more accurate information about many high-end cards by pressing the Probe button. This will use the more capable SuperVGA X server to gather information.
Select Video Card
Even as you first enter this screen, your video card should be auto-detected and the fields in this screen automatically filled in.
If your video card was detected incorrectly, select the "Probe" button to start a new video card auto-detection routine. If necessary, the video memory selection can be made manually.
Packages
50%
<<Back
Next>>
Help

11. After you click the Probe button, a dialog box appears, asking you to confirm the probe. Click the Probe button to continue or the Abort button to cancel the probe.
12. Your screen blanks and a dialog box with an OK button appears if the probe is successful. Click OK to close the dialog box, and then click Next to continue configuring the X Window System.
13. You now see a Select Monitor dialog box with a list of monitors and horizontal and vertical sync ranges, as shown in Figure 2.4. Scroll through the list of monitors, and click the model used with your system. If you do not see your monitor listed, enter your monitor's name and sync ranges below the scrolling list. Click the Monitor name field, and then type a name. Enter the low and high horizontal sync ranges by clicking on the up and down arrows, and then do the same for the low and high vertical sync ranges. When you finish, click the Next button.

FIGURE 2.4

Scroll through the list of monitors and either pick a specific monitor, or type in details about your computer's monitor.

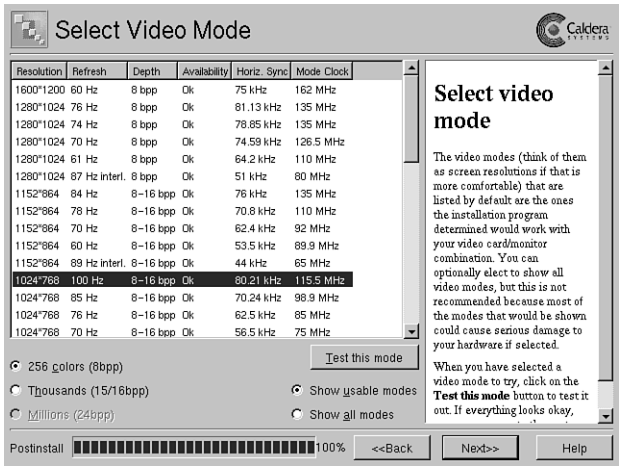

Select Monitor
Caldera
Name
Size
Horizontal Sync Range
Vertical Sync Range
Typical monitors
640x480, 60Hz 14 31.5 60
800x600, 56Hz 14 31.5–35.1 55–60
800x600, 60Hz 14 31.5–37.9 55–90
1024x768, 60Hz 15 31.5–48.5 55–90
1024x768, 70Hz 15 31.5–57 50–90
1280x1024, 60Hz 16 31.5–64.3 50–90
1280x1024, 74Hz 17 31.5–79 50–100
1280x1024, 76Hz 17 31.5–82 40–100
Aamazing
Acer Peripherals
Addonics
ADI
Altima
Amaga
Select your monitor
Select your monitor from the list of over 1,700 different monitors on the left.
If you do not see your monitor's make and model in the list, do not worry; simply take your monitor's documentation, look up the horizontal and vertical frequency ranges the monitor uses, then enter them in the correct spaces below the list window.
Or enter monitor details:
Monitor name (optional)
Typical monitors 1280x1024, 60Hz
Horizontal sync range in kHz
31
64
Vertical sync range in Hz
50
90
Packages
88%
<<Back
Next>>
Help

Make sure to enter correct sync values for your monitor! You can possibly damage your display with incorrect settings! You have been warned!

14. The next dialog box asks for your preferred video mode, as shown in Figure 2.5. Click a desired resolution, such as 800×600, which represents the number of pixels available across and down your display. Don't choose a resolution outside of your monitor's capabilities! Next, click a desired display depth from the list in the upper-right corner of your screen. When finished, click the Test This Mode button to test your settings.

FIGURE 2.5

The Select Video Mode dialog is used to pick the best resolution and color depth for your monitor and graphics card.


Select Video Mode
Caldera
Resolution Refresh Depth Availability Horiz. Sync Mode Clock
1600*1200 60 Hz 8 bpp Ok 75 kHz 162 MHz
1280*1024 76 Hz 8 bpp Ok 81.13 kHz 135 MHz
1280*1024 74 Hz 8 bpp Ok 78.85 kHz 135 MHz
1280*1024 70 Hz 8 bpp Ok 74.59 kHz 126.5 MHz
1280*1024 61 Hz 8 bpp Ok 64.2 kHz 110 MHz
1280*1024 87 Hz interl. 8 bpp Ok 51 kHz 80 MHz
1152*864 84 Hz 8-16 bpp Ok 76 kHz 135 MHz
1152*864 78 Hz 8-16 bpp Ok 70.8 kHz 110 MHz
1152*864 70 Hz 8-16 bpp Ok 62.4 kHz 92 MHz
1152*864 60 Hz 8-16 bpp Ok 53.5 kHz 89.9 MHz
1152*864 89 Hz interl. 8-16 bpp Ok 44 kHz 65 MHz
1024*768 100 Hz 8-16 bpp Ok 80.21 kHz 115.5 MHz
1024*768 85 Hz 8-16 bpp Ok 70.24 kHz 98.9 MHz
1024*768 76 Hz 8-16 bpp Ok 62.5 kHz 85 MHz
1024*768 70 Hz 8-16 bpp Ok 56.5 kHz 75 MHz
Select video mode
The video modes (think of them as screen resolutions if that is more comfortable) that are listed by default are the ones the installation program determined would work with your video card/monitor combination. You can optionally elect to show all video modes, but this is not recommended because most of the modes that would be shown could cause serious damage to your hardware if selected.
When you have selected a video mode to try, click on the Test this mode button to test it out. If everything looks okay,
Test this mode
256 colors (8bpp)
Thousands (15/16bpp)
Millions (24bpp)
Show usable modes
Show all modes
Postinstall
100%
<<Back
Next>>
Help

15. A confirm dialog box appears. Click OK to continue. The screen clears, and a representative X11 display appears for about 10 seconds, as shown in Figure 2.6. When the installation dialog box reappears, click the Next button to continue.

FIGURE 2.6

During your X11 configuration, OpenLinux lets you test your graphics card and monitor to make sure your settings are correct.

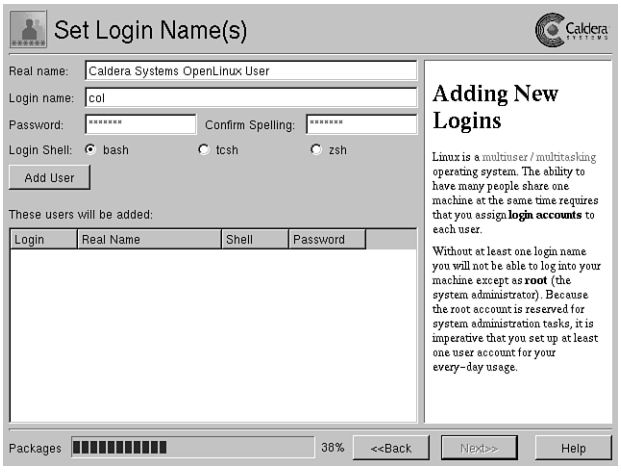
16. OpenLinux now asks you to set the root password. This is the password for the system administrator—you! Type in a password, then press Enter, and type it in again. Don't forget this password! You need this password to perform important configuration tasks during your OpenLinux sessions. When you finish, click the Next button.

Good passwords have a minimum of eight characters and contain a mix of letters and numbers.

17. The next dialog box asks you to add at least one new user to your OpenLinux system, as shown in Figure 2.7. Start by clicking the Real Name field, and enter your name. Press Enter, and then type in a Login name. Press Enter, and then type in a password. Press Enter, and then again enter the password. Next, click bash, tcsh, or zsh to select a Login Shell. When you finish, click the Add User button. To continue, click the Next button.

FIGURE 2.7

The Set Login Name(s) dialog is used to create new users during your OpenLinux installation. (Other users may be added or deleted after installation.

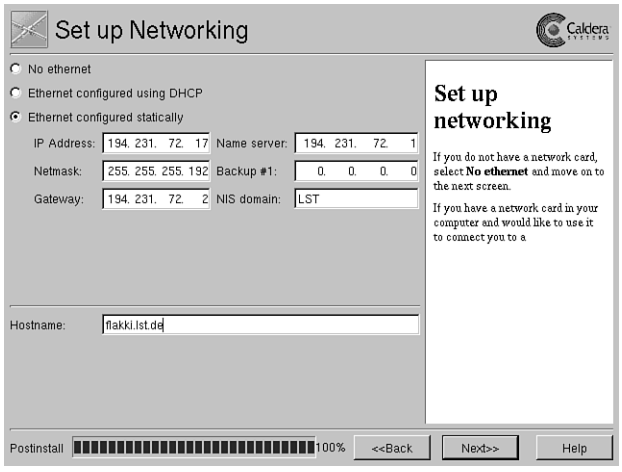

Set Login Name(s)
Caldera
Real name:
Caldera Systems OpenLinux User
Login name:
col
Password:
Confirm Spelling:
Login Shell:
bash
tcsh
zsh
Add User
These users will be added:
Login
Real Name
Shell
Password
Adding New Logins
Linux is a multiuser / multitasking operating system. The ability to have many people share one machine at the same time requires that you assign login accounts to each user.
Without at least one login name you will not be able to log into your machine except as root (the system administrator). Because the root account is reserved for system administration tasks, it is imperative that you set up at least one user account for your every-day usage.
Packages
38%
<<Back
Next>>
Help

Login names are generally the first letter of a person's name, followed by the last name. For example, Julie Lewis would have a login name of jlewis, and Jeff Goldfarb would have a login name of jgoldfarb.

18. You can now set up networking in the dialog shown in Figure 2.8. If your computer is attached to a network and you have a network card installed, enter the IP Address (such as `192.168.1.2`), Hostname (such as `wishbone.erols.com`), Netmask, and Gateway of your network. If your network has a Domain Name server, enter its IP address. If you don't have a network card, click the Next button to continue.

FIGURE 2.8

If you have a network card installed, use the Set Up Networking dialog to enter networking information, such as the Internet Protocol, or IP, address number of your computer.


Set up Networking
Caldera
No ethernet
Ethernet configured using DHCP
Ethernet configured statically
IP Address: 194. 231. 72. 17
Name server: 194. 231. 72. 1
Netmask: 255. 255. 255. 192
Backup #1: 0. 0. 0. 0
Gateway: 194. 231. 72. 2
NIS domain: LST
Hostname: flakki.lst.de
Set up networking
If you do not have a network card, select No ethernet and move on to the next screen.
If you have a network card in your computer and would like to use it to connect you to a
Postinstall
100%
<<Back
Next>>
Help

If you skip this, you can always add and configure a networking card later. See Hour 3, "Post-Installation Issues," for details.

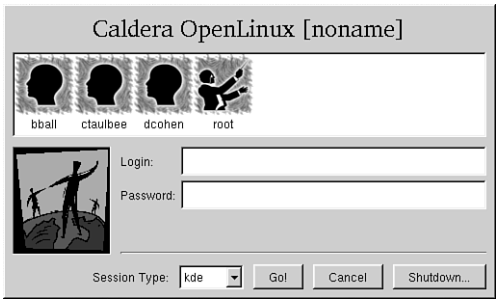
19. To make sure OpenLinux keeps accurate track of time, you're now asked to select your time zone. Scroll through the list of zones, and then click your time zone. If your computer's hardware clock is set to local time, click the Hardware Clock Runs in Local Time item, and then click Next to continue.
20. Now relax! It's time to play a familiar game of falling blocks while OpenLinux continues to copy files to your hard drive. Click New Game to start the action. Use your cursor keys to rotate, shift, or drop the blocks into place. While you play, the progress bar along the bottom of the screen helps you monitor the installation. When the install finishes, click the Finish button.

Finishing Your Linux Installation

Congratulations! Hang in there because you're almost finished installing OpenLinux! After you click Finish, OpenLinux reboots your computer to the K Desktop Environment's K display manager login screen (as shown in Figure 2.9).

FIGURE 2.9

Your first peek at OpenLinux is at the K display manager, where you must log in to Linux.



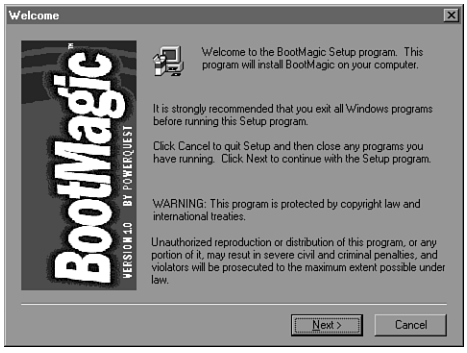
Although you can log in now if you want to, there's still an important step left in the installation! If you want to boot to Linux, you must first shut down, restart, and then install BootMagic from Windows.

Experienced Linux users might want to use LILO, but should know that at this point, unlike previous OpenLinux installs, LILO has been installed, and the default `/etc/lilo.conf` configuration file is configured to start LILO from the root Linux partition. This might not be what you want, but it is the proper configuration to support commercial boot loaders such as System Commander or the included version of Boot Magic. Although experienced LILO users might either use a boot floppy or install LILO in the Master Boot Record of the DOS partition, the MBR is needed by Boot Magic. At this point you have to decide if you want to use BootMagic or LILO. If you decide to use LILO, log in to OpenLinux as root, then edit `/etc/lilo.conf` to point to the MBR, and insert an entry to support booting DOS. (One is not included by default, and you might have noticed that the installation process does not offer you the opportunity to configure LILO.) If you decide to not use LILO by itself, BootMagic then uses LILO (installed on your Linux partition) to boot OpenLinux. For more information, see the file `README` under the `/usr/doc/lilo` directory.

Click the Shutdown button, then select Shutdown, and restart to reboot to Windows. When the Windows desktop appears, click the Post Install Boot Magic menu item from the OpenLinux folder on the Start menu. Make sure your OpenLinux CD-ROM is inserted in your computer. The BootMagic setup window appears, as shown in Figure 2.10.

FIGURE 2.10

To enable booting DOS, Windows, or Linux, you must install a boot loader, such as BootMagic.


Welcome
BootMagic
VERSION 4.0 BY POWERQUEST
Welcome to the BootMagic Setup program. This program will install BootMagic on your computer.
It is strongly recommended that you exit all Windows programs before running this Setup program.
Click Cancel to quit Setup and then close any programs you have running. Click Next to continue with the Setup program.
WARNING: This program is protected by copyright law and international treaties.
Unauthorized reproduction or distribution of this program, or any portion of it, may resut in severe civil and criminal penalties, and violators will be prosecuted to the maximum extent possible under law.
Next >
Cancel

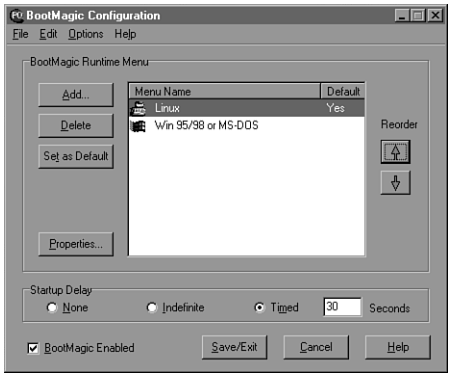
Follow the prompts to install BootMagic, entering your name and acknowledging the licensing agreements. When prompted to create a BootMagic boot diskette, insert a blank floppy in your computer, and follow the prompts. This is an important safety step that enables you to recover and boot your computer in case your drive's MBR becomes corrupted.

You can also make a BootMagic boot diskette later by clicking the Create BootMagic diskette icon in the BootMagic program folder on your Start menu.

BootMagic then installs on your computer, placing a boot loader in the MBR of your hard drive. After the installation finishes, you see the BootMagic Configuration window on your desktop, as shown in the Figure 2.11.

FIGURE 2.11

The BootMagic Configuration window is used to set the default operating system, reorder your booting list, or set startup delays.

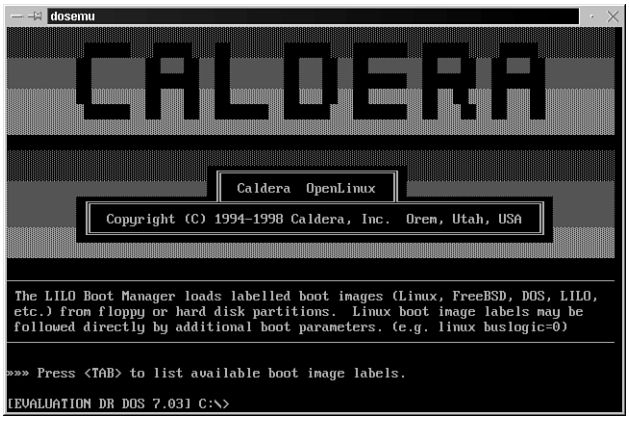


BootMagic recognizes that you have created and installed a Linux partition on your hard drive. Click the Linux menu name, and then click the Reorder button to move Linux up in the list (where it rightfully belongs). Next, click the Set as Default button to make Linux the default operating system to boot.

BootMagic's Startup Delay buttons and Timed delay field enable you to boot immediately, wait for a mouse click on an operating system name, or set a delay from 1 to 99 seconds before booting. Make sure the BootMagic Enabled checkbox is checked. When you finish configuring BootMagic, click the Save/Exit button to save your changes.

To boot to Linux and log in, restart your computer. BootMagic then loads and displays its boot menu, listing Linux and then Windows. Booting starts according to the delay you set in its configuration window. You then see Caldera's customized LILO message screen (from the file message under the `/boot` directory), as shown in Figure 2.12.

FIGURE 2.12
BootMagic uses LILO to boot Linux.


dosemu
CALDERA
Caldera OpenLinux
Copyright (C) 1994-1998 Caldera, Inc. Orem, Utah, USA
The LILO Boot Manager loads labelled boot images (Linux, FreeBSD, DOS, LILO, etc.) from floppy or hard disk partitions. Linux boot image labels may be followed directly by additional boot parameters. (e.g. linux buslogic=0)
»»» Press <TAB> to list available boot image labels.
[EVALUATION DR DOS 7.03] C:\>

Type **`linux`** at the boot prompt to start your OpenLinux session. If you do nothing, OpenLinux boots after 50 seconds.

The boot delay can be changed by editing the file `/etc/lilo.conf` and rerunning the `lilo` command.

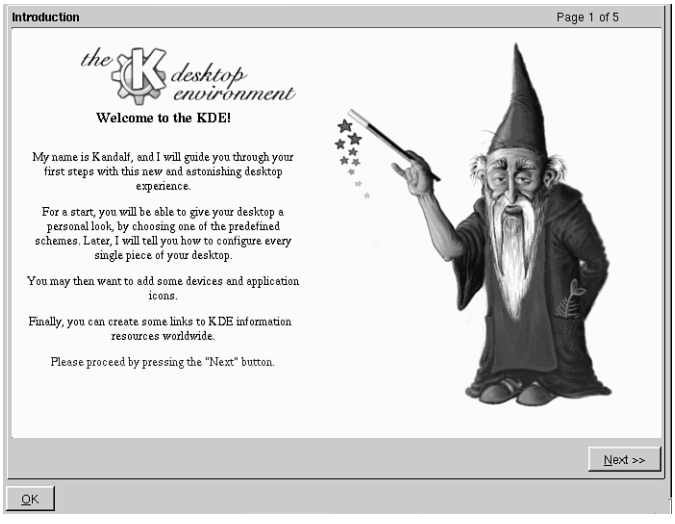
Logging in to Linux

After OpenLinux boots, you again see the kdm client's login screen. At the `login` prompt, type **`root`**, and then press Enter. Then, enter the password you used during the install process.

The screen clears, and you start your first OpenLinux session using the X Window System with the K Desktop Manager (discussed in Hour 8, "Exploring the K Desktop Environment"), as shown in Figure 2.13.

FIGURE 2.13

The first view of an OpenLinux X11 KDE session.


Introduction
Page 1 of 5
the K desktop environment
Welcome to the KDE!
My name is Kandalf, and I will guide you through your first steps with this new and astonishing desktop experience.
For a start, you will be able to give your desktop a personal look, by choosing one of the predefined schemes. Later, I will tell you how to configure every single piece of your desktop.
You may then want to add some devices and application icons.
Finally, you can create some links to KDE information resources worldwide.
Please proceed by pressing the "Next" button.
Next >>
OK

The main window on the desktop is the KDE configuration manager, which offers a one-time time configuration of KDE *themes*, or how you want KDE's windows, buttons, and colors to appear. Click the Next button to continue to the themes setup, and you see a selection of themes, as shown in Figure 2.14.

Click a theme icon (such as KDE, MacOS, Windows, or BeOS), and KDE automatically sets the theme for your KDE sessions. Then, click on the Next button to proceed to the next screen, as shown in Figure 2.15.

FIGURE 2.14

Select a window theme from KDE's configuration menu by clicking on a theme icon.

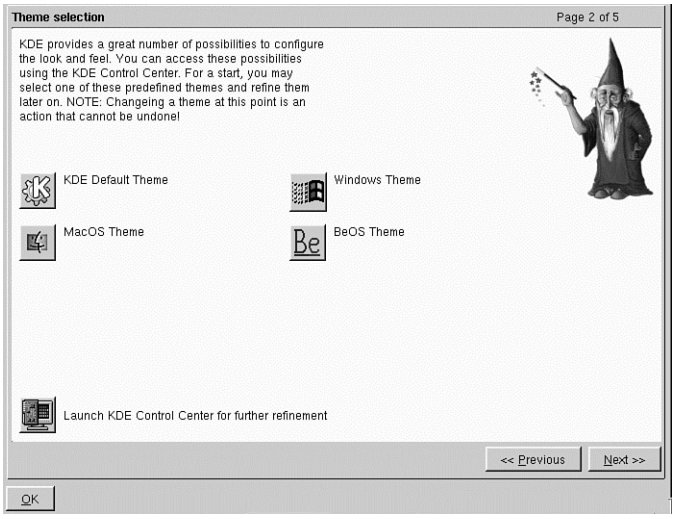

Theme selection
Page 2 of 5
KDE provides a great number of possibilities to configure the look and feel. You can access these possibilities using the KDE Control Center. For a start, you may select one of these predefined themes and refine them later on. NOTE: Changeing a theme at this point is an action that cannot be undone!
KDE Default Theme
Windows Theme
MacOS Theme
BeOS Theme
Launch KDE Control Center for further refinement
<< Previous
Next >>
OK

FIGURE 2.15

KDE's setup automatically creates convenient floppy and CD-ROM icons on your desktop.

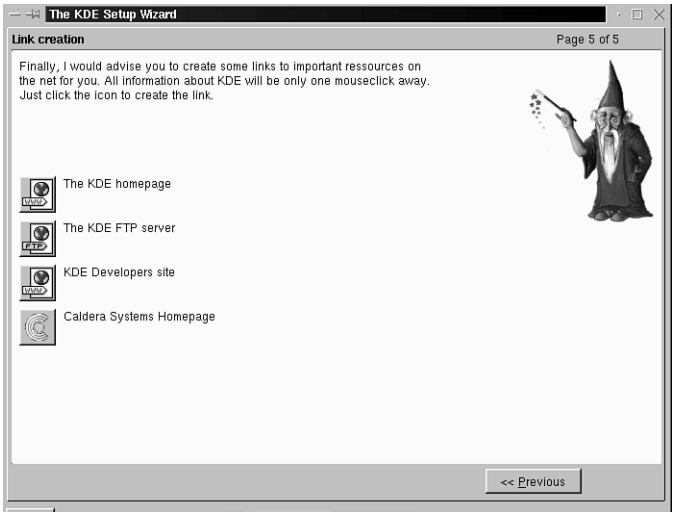
The KDE Setup Wizard
Drive configuration
Page 3 of 5
Ok, now we should add some nice icons for your disc and cdrom drives to the desktop.
You just have to click the drive icon to create/delete the icon.
1st Floppy Disc drive
2nd Floppy Disc drive
CD-ROM drive
<< Previous
Next >>

Click on each desired icon, and KDE puts each on your root desktop. These icons provide an easy way to view the contents of a floppy disk or can be used as drag-and-drop icons for copying. For example, if you have a floppy inserted in your computer, you can later drop a file onto the floppy icon to copy the file to diskette.

When you finish, click the Next button. The next screen asks if you want a printer icon. When you finish, click the Next button again to configure convenient hypertext links for your desktop (as shown in Figure 2.16).

FIGURE 2.16

KDE creates Internet and hypertext links on your desktop during setup.


The KDE Setup Wizard
Link creation
Page 5 of 5
Finally, I would advise you to create some links to important ressources on the net for you. All information about KDE will be only one mouseclick away. Just click the icon to create the link.
The KDE homepage
The KDE FTP server
KDE Developers site
Caldera Systems Homepage
<< Previous

After you finish, click the OK button. Your screen appears as shown in Figure 2.17 (depending on the theme you chose during setup).

FIGURE 2.17

A KDE-themed KDE desktop after configuration.

Rebooting and Shutting Down

At this point, you can exit your first KDE session by clicking the small icon above the padlock on the KDE panel (as shown in Figure 2.17) or by clicking the Application Starter button (the large "K") and clicking the logout menu item. KDE asks you to confirm the logout. Click the logout button; the screen clears, and you again see the kdm login screen. To shut down and restart your computer, click the Shutdown button, select Shutdown or Shutdown and Restart, and then click OK. Your computer shuts down or reboots to BootMagic.

Linux also offers a way to shut down or reboot from the command line of a terminal. After typing **su** and pressing enter to switch to superviser mode, use the `shutdown` command, along with its `-r` (reboot) option, followed by the word `now`, like this:

```
# shutdown -r now
```

Alternatively, you can use the number **0**, like this:

```
# shutdown -r 0
```

This reboots your computer. Use the `shutdown` command along with its `-h` (halt) option, followed by the word `now`, like this:

```
# shutdown -h now
```

Alternatively, you can use the number `0`, like this:

```
# shutdown -h 0
```

This shuts down OpenLinux. When you see the message "System is halted." you can turn off your computer.

Summary

This hour detailed a step-by-step simple OpenLinux installation session. Installing OpenLinux is a major hurdle in using Linux but is usually an easy accomplishment. Although some computer users might be disconcerted by having to partition a hard drive to install a dual-boot computer, most find the process relatively painless. Welcome to Linux!

Q&A

Q **I screwed up my LILO installation! My system won't boot to OpenLinux!**

A This is probably an error in the `/etc/lilo.conf` file. Use the OpenLinux boot diskette to reboot your computer. At the command line, type **`linux root=/dev/`*`your_hard_drive`*** (such as `/dev/hda1`). See the BootPrompt-HOWTO under the `/usr/doc/HOWTO` directory.

Q **What are some good documents to read about installing OpenLinux?**

A Although you can find many different documents installed under the `/usr/doc/HOWTO` or `/usr/doc/HOWTO/mini` directories, such as Linux+Win95, Loadlin+Win95, or the Linux Installation Guide, you should first read the technical documents, FAQs, and errata at `http://support.calderasystems.com/caldera` or `http://www.calderasystems.com/support/techguide.html`.

Exercises

1. Try rebooting your computer. Press the Tab key at the LILO boot prompt. What happens?
2. At the LILO boot prompt, type **`vga=ask`**, and press Enter. What happens?
3. After pressing Enter in the previous exercise and starting the boot process to OpenLinux, what happens next?

HOUR 3

Post-Installation Issues

This hour shows you how to configure OpenLinux to work with various hardware and software components. You'll learn how to disable or bypass X11 and the kdm graphical login, change the default color depth of your X11 server, configure OpenLinux to use your sound card, set and configure an Ethernet network interface, enable PCMCIA card service, and use a Zip drive.

If you've partitioned your hard drive, installed OpenLinux, and have successfully logged in and out of Linux, congratulations! Most of the hard work is done. This hour might help you finish your installation by showing you how to configure different computer hardware to work with OpenLinux.

All the configuration tasks described in this hour require you to be logged in as the root operator. Make sure you proceed slowly, and always make a backup copy of important files before editing the original!

The X Window System

The X Window System is the default graphical interface for Linux—but it is *not* OpenLinux. Originally developed by a consortium of computer companies and the Massachusetts Institute of Technology (MIT) , The X Window System, known as X11 or X, is a network windowing system that runs along with Linux to provide graphics services . The main task in configuring X11 is to choose the correct X11 server (included on your OpenLinux CD-ROM) and then to properly configure this server to work with your computer's graphics card.

Configuring X11 is one of the major hurdles new OpenLinux users face when installing OpenLinux. X11 runs on many different types of computers and works with many different types of graphics cards. You have a much better chance of configuring X11 to work with your graphics hardware if you have a graphics card that's been around in the market for at least two years. Having the latest and greatest graphics card lessens your chances of being able to use X—although you can still use Linux.

The version of X11 included on your OpenLinux CD-ROM comes from The Xfree86 Project, Inc. , a group of programmers from around the world who have worked very hard to provide a free graphical interface for Linux (and other operating systems , such as BSD). These folks deserve a big vote of thanks. To read more about The XFree86 Project, browse to `http://www.xfree86.org`.

How the X Window System is Configured

This section introduces you to X11's configuration file for OpenLinux: the `XF86Config` file, found under the `/etc` directory. During your OpenLinux installation, X11 used a graphical interface by starting an X11 server named `XF86_VGA16` . Hopefully, your OpenLinux desktop now takes the best advantage of your computer's monitor and graphics card with a properly selected X server and configuration file. However, if you need to reconfigure X11 because you install a new graphics card or if X11 isn't working to your satisfaction, you can reconfigure X11.

The `xf86config` command configures X11 through a text-based interface . Before you begin, take some time to read documentation under the `/usr/X11R6/lib/X11/doc` directory. This directory, summarized in Table 3.1, contains numerous documents with information about accelerated video graphics , different video monitors , various graphics chipsets , different video modes , and several helpful text files filled with tips on configuring X11.

TABLE 3.1 XFree86 Documentation

File	*Description*
AccelCards	List of tested accelerated graphics cards
BUILD	How to compile the XFree86 X distribution from source
COPYRIGHT	Copyright statement
Devices	Old file of contributed `XF86Config` Device sections
Monitors	Old file of contributed `XF86Config` Monitor sections
QuickStart.doc	Quick-start guide to setting up XFree86
README	General information about the current XFree86 release
README.Config	Detailed, step-by-step guide to configuring XFree86
README.DECtga	Information for DEC 21030 users
README.DGA	How to program for the XFree86 DGA interface
README.LinkKit	Specific information on how to build XFree86 from scratch
README.Linux	Good information for Linux users about installing and using XFree86
README.MGA	Information about the Matrox Millennium & Mystique video cards
README.Mach32	Information about the Mach32 XFree86 X server
README.Mach64	Release notes about the Mach64 XFree86 X server
README.NVIDIA	Notes for NVidia NV1, SGS-Thomson STG2000, and RIVA 128 video cards
README.Oak	Notes for Oak Technologies Inc. chipset users
README.P9000	Release notes for the P9000 XFree86 X server
README.S3	Notes for S3 chipset users
README.S3V	Notes for S3 ViRGE, ViRGE/DX, ViRGE/GX, ViRGE/MX, and ViRGE/VX users
README.SiS	Notes for Sis chipset users
README.Video7	Readme file about Video7 drivers

continues

TABLE 3.1 CONTINUED

File	*Description*
README.W32	Notes for W32 and ET6000 chipset users
README.WstDig	Notes for Western Digital chipset users
README.agx	Information about the AGX XFree86 X server
README.apm	Notes about the Alliance Promotion chipset
README.ark	Notes for ARK Logic chipset users
README.ati	Information about XFree86's ATI Adapters video drivers
README.chips	Notes about Chips and Technologies chipsets
README.cirrus	Information about XFree86 support for Cirrus Logic chipset
README.clkprog	Programming info about external video clock setting programs
README.cyrix	Information about Cyrix chipsets
README.epson	Information about EPSON SPC8110 (laptop) chipsets
README.mouse	Details about XFree86's X11 mouse support
README.neo	Information about NeoMagic (laptop) chipsets
README.rendition	Information about the Rendition chipset
README.trident	Notes for Trident chipset users
README.tseng	Notes for Tseng chipset users
RELNOTES	Definitive release notes for XFree86
ServersOnly	How your directories should look when building XFree86 X servers
VGADriver.Doc	HOWTO on adding an SVGA or VGA drive to XFree86
VideoModes.doc	Eric S. Raymond's comprehensive treatise on building `XF86Config` modelines
xinput	General info on input device (such as joystick) support in XFree86

Before you use the `xf86config` command to reconfigure X11, log in as the root operator, and make a backup copy first, like so:

```
# cp /etc/XF86Config /etc/XF86Config.org
```

You can then start the command by typing it on the command line of a terminal window like this:

```
# xf86config
```

After you press Enter, follow the prompts to configure your graphics card and monitor for X11. The `xf86config` command generates a new `XF86Config` file in the `/etc` directory.

The `XF86Config` File

The `XF86Config` file is used to properly feed font, keyboard, mouse, video chipset, monitor capabilities, and color depth setting information to your selected X11 display server. `XF86Config` is a single text file that consists of several sections that are summarized in Table 3.2.

You can page through your system's `XF86Config` file by using the `less` command (discussed in Hour 4, "Reading and Navigation Commands"). At the command line of a terminal, use `less`, followed by the path to `XF86Config`, like this:

```
# less /etc/XF86Config
```

You can then use the cursor keys to browse through the file. Press the Q key when you finish reading.

TABLE 3.2 MAJOR SECTIONS OF THE *XF86Config* FILE

Section	*Purpose*
Files	Tells the X server where colors, fonts, or specific software modules are located
Module	Tells the X server what special modules should be loaded
ServerFlags	Contains on/off flags to enable or deny special actions, such as core dumps , keyboard server shutdown , video-mode switching , video tuning , and mouse and keyboard configuration
Keyboard	Tells the X server what keyboard to expect and what settings to use
Pointer	Tells the X server what pointer to use and how buttons are handled
Xinput	Special section for devices, such as graphics pads , styli, and so on
Monitor	Specifies details and settings for your monitor , such as name, horizontal sync ranges , vertical sync ranges , and modelines (one for each video resolution , such as 640×480, 800×600, 1024×768, and so on)
Device	Provides details about your video chipset , such as RAM , clockchips , and so on
Screen	Specifies what X server to use, the color depth (such as 8-, 16-, 24-, or 32-bits per pixel), screen size (such as 640×480, 800×600, 1024×768, and so on), and the size of the virtual screen

Do not use an `XF86Config` from someone who does not have the same graphics card and monitor as you! Incorrect settings can damage your monitor. Do not use monitor settings outside you monitor's specifications . You have been warned! The *only* exception to this rule might be for PC notebook users with *exactly* the same components.

Before you try to start an X11 session using your new `XF86Config` settings , as the root operator , open the file in your favorite text editor , disable line wrapping , and check the settings. It is essential, especially for laptop users , to do this to check the created settings, enable or disable some X server options , enter the correct amount of video memory , and fine-tune monitor settings.

The `XF86Config` Files Section

The Files section tells the X server the location of the color name database and system fonts .

The `XF86Config` ServerFlags Section

Several parts of this section can be used to configure special actions enabled by your XFree86 X server . Enable a particular action by removing the pound sign (`#`) in front of the specific flag. Most users do not disable the `DontZap` feature because it provides a quick way to exit an X session . The `DontZoom` feature can be disabled if you use X in only one video resolution , such as 800×600 pixels.

The `XF86Config` Keyboard Section

The Keyboard section tells the X server what type of keyboard to expect and settings to use, such as language type , key character layout , and manufacturer.

The `XF86Config` Pointer Section

The Pointer section tells the X server what pointer, or mouse, to use and how the buttons are handled. Some `Protocol` settings are `Auto` for a serial mouse and `BusMouse` for a bus mouse. The `Device` entry, `/dev/mouse`, is a symbolic link to the actual device (such as `/dev/ttys0` for a serial mouse).

Two-button mouse users definitely want to enable the three-button emulator , in which simultaneously depressing both buttons simulates pressing the middle button, or button 2. One common use of button 2 is to paste text or graphics. For more information about configuring a mouse, see the file `README.mouse` under the `/usr/X11R6/lib/X11/doc` directory.

The `XF86Config` Monitor Section

Although the first several parts of the `XF86Config` file are easy to understand , if you're an XFree86 user whose initial `XF86Config` file does not work, pay specific attention to the Monitor section, the Device section, and the Screen section. The Monitor section contains specific details and settings for your monitor, such as your monitor's name, its horizontal and vertical sync ranges, and critical modelines (one for each video resolution, such as 640×480, 800×600, 1024×768, and so on). Understanding the modeline is the key to fine-tuning your X11 display.

For the best details, see the files `VideoModes.doc` and `README.Config` under the `/usr/X11R6/lib/X11/doc` directory before fine-tuning modelines in your `XF86Config` file. Another good tutorial is the XFree86-Video-Timings-HOWTO under the `/usr/doc/HOWTO` directory.

The basic parts of a modeline are 10 different values representing the following (from left to right):

- A label of the screen resolution , such as 800×600
- A video frequency in MHz
- The number of visible dots per line on your display
- The Start Horizontal Retrace value (number of pulses before video sync pulse starts)
- The End Horizontal Retrace value (end of sync pulse)
- The total number of visible and invisible dots on your display
- The Vertical Display End value , or number of visible lines of dots on your display
- The Start Vertical Retrace value (number of lines before the sync pulse starts)
- The End Vertical Retrace value (number of lines at the end of the sync pulse)
- The Vertical Total value , or total number of visible and invisible lines on your display

The `XF86Config` Device Section

The Device section contains details about your video chipset , such as RAM , clockchips , and so on. Note that even though you tell `xf86config` or `XF86Setup` that you have two megabytes of video RAM , these values are commented out with a pound sign (`#`). To properly configure for X, you need to remove the pound sign in front of the `VideoRam` setting in this part of the `XF86Config` file.

This section of your `XF86Config` file is critical. The device definition is used to tell the X server exactly what type of video chipset and options to support. For a list of device identifiers and options, see the README file under the `/usr/X11R6/lib/X11/doc` directory corresponding with your chipset.

The `XF86Config` Screen Section

The Screen section tells what X server to use, the color depth (such as 8-, 16-, 24- or 32-bits per pixel), screen size (such as 640×480, 800×600, or 1024×768, and so on), and the size of the virtual screen.

This section contains directions for your chosen X server (the `XF86_SVGA` or other color server, the 4-bit, or 16-color `XF86_VGA16` server, or the monochrome server, `XF86_Mono`) on what resolutions and virtual screen size to support.

For example, if you're using the 8-bit, or 256-color, mode of the XF86_SVGA server, you might have the choice of a 640×480 display (with an 800×600 virtual screen) or an 800×600 display. Resolutions can be toggled during your X session by holding down the **Ctrl+Alt** keys and depressing the plus (+) or minus (-) keys on your keypad. Laptop users need to use the NumLock key before switching resolutions.

Bypassing or Disabling the kdm Login Display

The default OpenLinux configuration uses X11 and the kdm client to provide a log-in screen. However, you can bypass this screen and go directly to a log-in prompt for a text-only console (without X11) by pressing Ctrl+Alt+F2. You then see a log-in prompt. To return to the kdm login, press Alt+F1.

Alt+F1 or Alt+F2 are known as *virtual consoles*. This means that with Linux, you can have up to six different logins from the keyboard of the same computer at the same time. See Hour 7, "Using the X Window System," for details about using virtual consoles and X11.

If you don't want Linux to start X11 or use the kdm graphical login display, you can configure OpenLinux not to use kdm after booting. First, log in as the root operator, and make a copy of the file `inittab` under the `/etc` directory with the `cp` command like this:

```
# cp /etc/inittab /etc/inittab.org
```

Next, use a favorite text editor (discussed in Hour 14, "Text Processing"), open the file, and look for the following line:

```
id:5:initdefault
```

Change the number `5` (which is the X11 runlevel) in the line to a `3` (which is the multi-user runlevel without X), like this:

```
id:3:initdefault
```

Save the file, then reboot your computer. After Linux reboots, wait until OpenLinux has reported the booting progress, and then press Alt+F2. You see a log-in prompt.

However, a much safer way to not use X11 is to tell OpenLinux to boot directly to multi-user mode at the LILO boot prompt, like this:

```
linux 3
```

After you press Enter, OpenLinux boots without using X11 or kdm.

Starting an X11 Session

If you've configured OpenLinux not to use X11, you can start an X11 session by typing **`startx`** at the command line after you log in. To start an X session using the K Desktop Environment , type **`kde`** at the command line. To start an X session using more than 256 colors, use **`startx`** or **`kde`** , as in the following two examples (you can also try substituting `24` or `32`):

```
# startx -- -bpp 16
```

```
# kde -- -bpp 16
```

You can also change the default color depth used when you boot OpenLinux and start X11. Open your system's `XF86Config` file, and look in the `Screen` section for the following line:

```
DefaultColorDepth 16
```

This entry tells the default X server to use thousands of colors for the display. If you know your computer can use millions of colors (from testing during your OpenLinux install), change the setting to the following:

```
DefaultColorDepth 32
```

Save the file, and restart X11 from the command line or through the kdm Shutdown button.

Your graphics card and monitor must be capable of supporting more than 256 colors to use greater color depths, such as 16, 24, or 32. Incorrect settings will result in the X server repeatedly trying to use bad settings and will make logging into Linux nearly impossible. Test your graphics card and monitor when you install OpenLinux; you'll then know what default settings you can use.

Configuring Sound for OpenLinux

Configuring OpenLinux to use your computer's sound system can be considered one of the last major hurdles in a successful Linux installation. Of course, if playing music, watching Internet TV, or participating in recreational death matches with Quake is important to you, sound configuration is an important task.

The good news is that over the last several years, Linux has evolved to make the job of configuring sound a lot easier. In the past, configuring Linux to use sound involved a potentially frustrating cycle of configuring kernel source code, compiling, and testing. Today, however, the kernel uses loadable code modules to provide sound support for your computer.

Even better news is that most computers today follow common protocols when playing sound. You can easily configure OpenLinux to play sound through your computer's sound card.

Loading Sound Modules

OpenLinux comes with nearly 30 loadable code sound modules, found under the `/lib/modules/`*`2.2.3`*`/sound` directory, where *`2.2.3`* is the version of your OpenLinux kernel (or the output of the `uname` command with the `-r` option). See the following example:

```
# uname -r
2.2.3
# ls /lib/modules/2.2.3/sound
aci.o            gus.o            opl3sa2.o        soundlow.o
ad1816.o         mad16.o          pas2.o           sscape.o
ad1848.o         maui.o           pss.o            trix.o
adlib_card.o     mpu401.o         sb.o             uart401.o
aedsp16.o        msnd.o           sgalaxy.o        uart6850.o
awe_wave.o       msnd_classic.o   softoss2.o       v_midi.o
cs4232.o         msnd_pinnacle.o  sonicvibes.o     wavefront.o
es1370.o         opl3.o           sound.o
es1371.o         opl3sa.o         soundcore.o
```

These code modules support sound cards configured for a stock OpenLinux 2.2 kernel. You can read about the specific configuration of your kernel by looking at the `WHATSIN-`*`2.2.3`*`-modular` document (where *`2.2.3`* is the version of your Linux kernel) under the `/boot` directory. Table 3.3 lists just some of the cards (and compatibles) and modules supported by OpenLinux.

TABLE 3.3 OPENLINUX 2.2 KERNEL MODULE SOUND SUPPORT

Name	*Module(s)*
Crystal CS4232 (PnP)	cs4232.o, ad1848.o
Ensoniq ES1370	es1370.o
Ensoniq ES1371	ES1371.O
Ensoniq SoundScape	sscape.o
Generic OPL2/OPL3 FM synthesizer	opl3.o
Gravis Ultrasound	gus.o
MediaTrix AudioTrix Pro	trix.o
MPU-401	mpu401.o
OPTi MAD16, Mozart	mad16.o
ProAudioSpectrum 16	pas2.o
PSS, ECHO-ADI2111	pss.o
Rockwell Wave Artist (Netwinder)	waveartist.o
SoftOSS software wave table	softoss2.o
Sound Blaster compatibles, Aztec Sound Galaxy, SB16/32/64/AWE, ESS, Jazz16	sb.o
Sound card support	sound.o, sbcard.o
Turtle Beach Wave Front, Maui, Tropez	wavefront.o, maui.o
Yamaha OPL3-SA1	opl3.o

Before you can begin, find and write down the I/O port addresses, IRQ, and DMA channel number for your computer's sound system. You have this information if you followed the recommendations in Hour 1, "Preparing to Install Linux."

If you performed a full installation of OpenLinux from the CD-ROM (which includes the source code for Linux), you can find an excellent tutorial, along with details about configuring OpenLinux to work with sound cards. Look at the directory `/usr/src/linux/Documentation/sound`, and definitely read the file `README.modules`. The `/usr/src/linux/drivers/sound` directory contains the source code to the sound modules. Also read the Sound-HOWTO under the `/usr/doc/HOWTO` directory.

Log in as the root operator. At the command line of your console or an X11 terminal window, use the `insmod` command to load the sound kernel modules. This procedure should work for most computers with SoundBlaster or equivalent cards. Type the following, and replace the `io`, `irq`, and `dma` values with those for your computer:

```
# insmod sound
# insmod uart401
# insmod sb io=0x220 irq=5 dma=1
```

You can then see if the sound modules were loaded with the `lsmod` command, like this:

```
# lsmod
Module                  Size  Used by
sb                     32660   1
uart401                 5936   1  [sb]
sound                  58584   0  (autoclean) [sb uart401]
soundcore               2404   5  (autoclean) [sb sound]
soundlow                 300   0  (autoclean) [sound]
...
```

You can also try looking at the output of the `/dev/sndstat` device, like this (your output might look different):

```
# cat /dev/sndstat
OSS/Free:3.8s2++-971130
Load type: Driver loaded as a module
Kernel: Linux noname.nodomain.nowhere 2.2.3 #1 Tue Mar 9 23:27:39 MST 1999
i586
Config options: 0

Installed drivers:

Card config:

Audio devices:
0: ESS ES1688 AudioDrive (rev 11) (3.1)

Synth devices:

Midi devices:

Timers:
0: System clock

Mixers:
0: Sound Blaster
```

Testing Your Sound Configuration

Try to play a sound included in the KDE distribution. Use the `play` command to test your sound card by playing `ktalkd.wav (the sound of a phone ringing)`, like this:

```
# play /opt/kde/share/sounds/ktalkd.wav
```

If your sound configuration does not work the first time, or if you enter an incorrect setting, use the `rmmod` command, followed by the name of the driver, to unload each sound module from system memory and try again. If the sound works, great!

You can find numerous sound utilities for OpenLinux installed from this book's CD-ROM. Some handy utilities include `kmix` for KDE and `xmixer` to control the balance and source of your system's sound.

Configuring Sound with COAS

OpenLinux comes with a new utility, the Caldera Open Administration System, or COAS, that you can use to administer and configure Linux. COAS can be used to control many different features of your OpenLinux system, including the following:

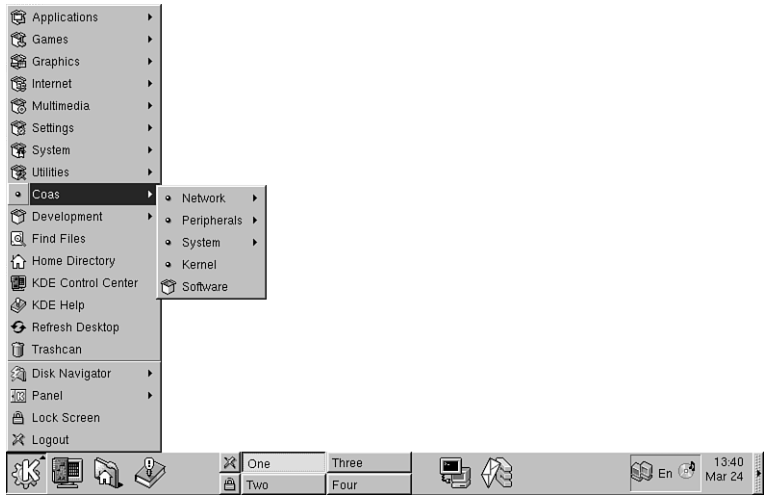
- Ethernet interfaces, such as the Internet Protocol (IP) address of your computer
- Filesystems, such as mounting options for local or remote storage devices
- Hostname resolution, such as where your computer looks up the names and addresses of other computers
- Kernel module boot-time control to load or unload kernel modules, such as those for sound, from memory (more than 350 kernel modules are included with OpenLinux)
- Mail, such as setting how your email messages are sent or received
- Network services, such as the Network Information Service
- Peripheral controls for configuring your keyboard, mouse, or printer
- Software management to control the types of software, such as scientific or text processing packages, installed on your computer
- System resource information to provide information about your computer's Central Processing Unit (CPU)
- System services, such as what services to start when booting (for example, printing)
- Time, such as setting your system's clock and timezone (useful when traveling)
- User management, such as adding, deleting, or renaming users and passwords

COAS is a "work in progress." This means that not all functions might be enabled with the version included on your CD-ROM. Check `http://www.calderasystems.com` and browse through the news and support areas for information about your version of OpenLinux.

When you have sound working, start COAS by clicking the Application Starter button on your K Desktop Environment's panel; select COAS, and then click the Kernel menu item, as shown in Figure 3.1.

FIGURE 3.1

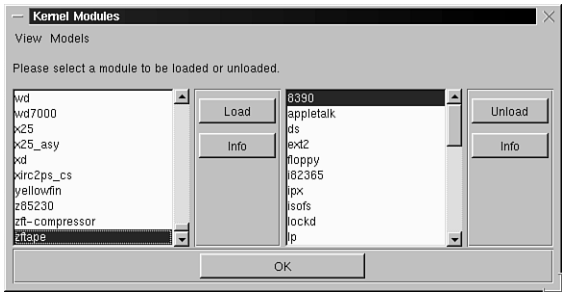
The COAS client can be used to configure OpenLinux kernel modules.



You see a short welcome dialog box. Click the OK button or press Enter to continue. You then see a dialog box, shown in Figure 3.2, with a list of currently loaded kernel modules on the right, and available modules on the left.

FIGURE 3.2

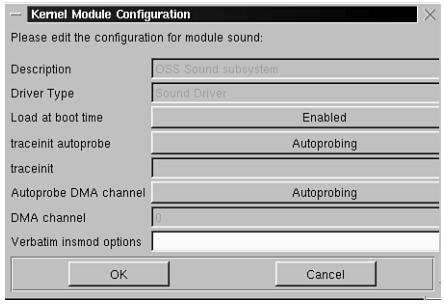
Configure your system's kernel modules by clicking the module's name in the left (unloaded) or right (loaded) dialog box list.



Using this previous example, scroll through the list of modules on the left, then select the `sound` module, and click the Load button. A dialog box appears, as shown in figure 3.3.

FIGURE 3.3

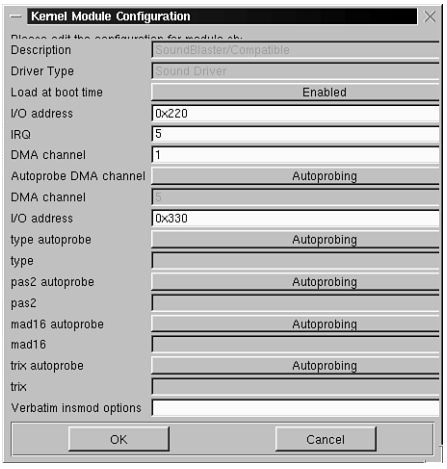
Configure how or when a kernel module is loaded with COAS.



Because no options are needed (for this example), make sure the **Load at boot time** button is enabled. Click the OK button. Next, scroll through the list of modules on the left, select the `uart401` module, and click the Load button. Again, ensure loading at boot time, and click OK. To finish configuring for sound, scroll through the list of modules, and select the `sb` module. Click the Load button, and you see a dialog box similar to the one in Figure 3.4.

FIGURE 3.4

Configure SoundBlaster-compatible card kernel modules easily for Linux with COAS!



Click in the I/O address, IRQ, and DMA fields, and enter your sound card's addresses. Make sure boot-time loading is enabled, and click the OK button. The module loads (you might hear a slight "click"), and your card is configured! To exit COAS, click the OK button.

A Quick Recording Script

Here's a short recording script you can use to record sound with a built-in or attached microphone. The script works by using the `dd` command to save and convert a specified amount of data (in seconds) to your hard drive. Type the script in Listing 3.1 in a file using your favorite text editor:

LISTING 3.1 THE RECORDER SCRIPT

```
#! /bin/sh
# recorder – record sound to disk file
# usage: recorder [n] soundfilename
echo -ne "recording "
echo -ne $1
echo -ne " seconds of sound to "
echo $2.au
/bin/dd bs=8k count=$1 </dev/audio >$2.au
```

Save the file with a name, such as `recorder`, and then use the `chmod` command to make the script executable, like this:

```
# chmod +x recorder
```

First, use `kmix` or `xmixer` to set your microphone's input level. To record a sound, type `recorder`, followed by a number in seconds, like this:

```
# recorder 5 myfirstsound
```

The script responds with the following:

```
recording 5 seconds of sound to myfirstsound.au
5+0 records in
5+0 records out
```

Play the sound by sending it to your audio device, like this:

```
# cat myfirstsound.au >/dev/audio
```

Configuring Sound the Easy Way

Of course, there's an even easier way to configure OpenLinux for sound. Browse to `http://www.opensound.com/linux.html`, and download a copy of the Open Sound System, or OSS. You can find links to detailed technical procedures for manual sound configuration, or you can use the commercial version of OSS, which supports more than 200 sound cards (and which saves you a *lot* of time and effort).

OSS installs using a shell script. When you buy OSS online, you receive a license message by email. You can also use a 30-day demonstration version to try out the software. If you're having a hard time configuring sound on your system, give OSS a try!

Enabling PCMCIA Cards

If you installed OpenLinux on your laptop, one of the first tasks you should perform is enabling your PC card slots. Nearly all laptops come with a Type III or Type II PC card slot, which is typically used for a modem or Ethernet network card. However, there are many different types of PC cards used for functions, such as the following:

- ATA/IDE card drives (Flash cards, interfaces)
- ATA/IDE CD-ROM interfaces
- Ethernet interface
- Ethernet/modem combination cards
- Fast Ethernet interface
- Modems
- SCSI interfaces
- Serial interfaces
- Token-ring interface
- Wireless network interfaces

You can find a list of more than 275 cards supported by David Hind's PCMCIA Card Services package, which is a collection of kernel modules that automatically load and recognize inserted PC cards during the boot process. Read the file `SUPPORTED.CARDS` under the `/usr/doc/pcmcia` directory.

Even if your card is not listed, it might work, especially if it is a modem card.

Winmodem PC cards, such as several models in the MegaHertz line or from other manufacturers, do **not** work under Linux. Do not purchase a winmodem modem or PC card for Linux.

Although the Card Services package is distributed only in source form through links at `http://hyper.stanford.edu/HyperNews/get/pcmcia/home.html` or Linux download sites, such as `ftp://metalab.unc.edu/pub/Linux/kernel/pcmcia`, you can find installed binaries of the modules on your OpenLinux system under the `/lib/modules/2.2.3/pcmcia` directory. However, Caldera OpenLinux (and indeed, no other distribution) does not have a laptop option for enabling Card Services. You must manually configure OpenLinux for your laptop's PC card controller.

Make sure that Card Services is installed on your computer. If you do not see a `/usr/doc/pcmcia-cs-3.0.9` directory on your system, chances are that Card Services is not installed. To install card services, insert your OpenLinux CD-ROM in your computer, and then mount the CD-ROM like this:

```
# mount /mnt/cdrom
```

Next, use the `rpm` command to install the software like this:

```
# rpm -i /mnt/cdrom/col/install/RPMS/pcmcia*.rpm
```

This installs the necessary software and documentation.

To enable the Card Services package for PCMCIA support, use your favorite text editor, and open the file `pcmcia` under the `/etc/sysconfig` directory. It looks like this:

```
PCMCIA=yes
PCIC=
PCIC_OPTS=
CARDMGR_OPTS="-f "
```

If you want to disable Card Services, type the word **no** in the `PCMCIA=` line. However, in order to use Card Services, you must enter the type of PCMCIA controller used for your laptop in the `PCIC=` entry. For many users the value **i82365** or **tcic** works. Your entry might look like this:

```
PCMCIA=yes
PCIC=i82365
PCIC_OPTS=
CARDMGR_OPTS="-f "
```

Save the file and exit your text editor. You can then reboot OpenLinux or start Card Services like this:

```
# /etc/rc.d/init.d/pcmcia start
Starting PCMCIA services: modules cardmgr
```


Card Services starts and reports that `cardmgr`, the PCMCIA device manager, has been activated. This device manager monitors your PC card slots for card inserts or removals. If you have a modem card inserted, you should then be able to use the modem. Other cards, such as Ethernet interfaces, will be recognized but cannot be used until you properly configure OpenLinux for networking.

After starting Card Services, you can check its status in at least three ways. First, you can use the `dmesg` command, like this:

```
# dmesg
…
Linux PCMCIA Card Services 3.0.9
  kernel build: 2.2.3 #1 Tue Mar 9 05:22:33 MET 1999
  options:  [pci] [cardbus]
Intel PCIC probe:
  TI 1131 PCI-to-CardBus at bus 0 slot 10, mem 0x68000000,
   2 sockets
    host opts [0]: [ring] [pci + serial irq] [no pci irq]
    [lat 168/176] [bus 32/34]
    host opts [1]: [ring] [pci + serial irq] [no pci irq]
    [lat 168/176] [bus 35/37]
    ISA irqs (scanned) = 3,4,7,9 status change on irq 9
cs: IO port probe 0x1000-0x17ff: clean.
cs: IO port probe 0x0100-0x04ff: excluding 0x330-0x337
0x378-0x37f 0x388-0x38f 0x408-0x40f 0x480-0x48f 0x4d0-0x4d7
cs: IO port probe 0x0a00-0x0aff: clean.
cs: memory probe 0xa0000000-0xa0ffffff: clean.
eth0: NE2000 Compatible: port 0x300, irq 3, hw_addr 00:E0:98:04:AA:D5
…
```

Not all the `dmesg` output is shown here, but you can see that the service has been loaded and that an Ethernet PC card was found by Card Services.

Another way to check is to look at your OpenLinux system log, a file named `messages` found under the `/var/log` directory. Use the `less` pager, followed by the pathname to the file, like this:

```
# less /var/log/messages
…
Mar 23 22:20:32 noname kernel: Linux PCMCIA Card Services 3.0.9
Mar 23 22:20:32 noname kernel:   kernel build: 2.2.3 #1 Tue Mar 9
05:22:33 MET 1999
Mar 23 22:20:32 noname kernel:   options:  [pci] [cardbus]
Mar 23 22:20:32 noname kernel: Intel PCIC probe:
Mar 23 22:20:32 noname kernel:   TI 1131 PCI-to-CardBus at bus 0
slot 10, mem 0x68000000, 2 sockets
Mar 23 22:20:32 noname kernel:     host opts [0]: [ring] [pci +
serial irq] [no pci irq] [lat 168/176] [bus 32/34]
Mar 23 22:20:32 noname kernel:     host opts [1]: [ring] [pci +
serial irq] [no pci irq] [lat 168/176] [bus 35/37]
Mar 23 22:20:32 noname kernel:     ISA irqs (scanned) = 3,4,7,9 status
change on irq 9
Mar 23 22:20:32 noname cardmgr[991]: starting, version is 3.0.9
Mar 23 22:20:32 noname cardmgr[991]: watching 2 sockets
Mar 23 22:20:32 noname kernel: cs: IO port probe 0x1000-0x17ff: clean.
Mar 23 22:20:32 noname kernel: cs: IO port probe 0x0100-0x04ff: excluding
0x330-0x337 0x378-0x37f 0x388-0x38f 0x408-0x40f 0x480-0x48f 0x4d0-0x4d7
Mar 23 22:20:32 noname kernel: cs: IO port probe 0x0a00-0x0aff: clean.
Mar 23 22:20:33 noname cardmgr[991]: initializing socket 0
Mar 23 22:20:33 noname kernel: cs: memory probe 0xa0000000-0xa0ffffff:
clean.
Mar 23 22:20:33 noname cardmgr[991]: socket 0: Linksys EtherFast 10/100
Fast
Ethernet
Mar 23 22:20:33 noname cardmgr[991]: executing: 'insmod
/lib/modules/2.2.3/net/8390.o'
Mar 23 22:20:33 noname cardmgr[991]: executing: 'modprobe net/8390'
Mar 23 22:20:33 noname cardmgr[991]: executing: 'insmod
/lib/modules/2.2.3/pcmcia/pcnet_cs.o'
Mar 23 22:20:33 noname kernel: eth0: NE2000 Compatible: port 0x300, irq 3,
hw_addr 00:E0:98:04:AA:D5
Mar 23 22:20:33 noname cardmgr[991]: executing: './network start eth0'
Mar 23 22:20:33 noname cardmgr[991]: + eth0: configuration file not found.
Mar 23 22:20:33 noname cardmgr[991]: start cmd exited with status 1
Mar 23 22:20:33 noname cardmgr[991]: exiting
…
```

Not all the output is shown here, but you can see that additional information, such as the model of your recognized card (in this case a Linksys EtherFast 10/100 card), is shown. Looking at your system's log is also a good way to diagnose other problems.

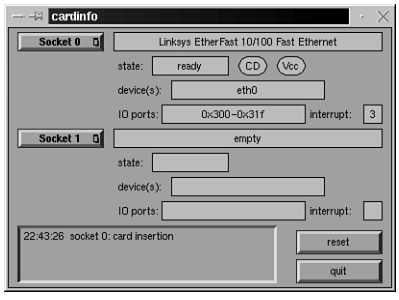
A third way to diagnose, check, or reset your PC cards, if you're using X11, is with David Hind's `cardinfo` client. Start `cardinfo` from the command line of a terminal window like this:

```
# cardinfo
```

After you press Enter, you see a window somewhat like that in Figure 3.5.

FIGURE 3.5

The `cardinfo` X11 client can be used to monitor, reset, suspend, eject, or insert PC cards with OpenLinux.



A small log window in the lower left of the `cardinfo` dialog box lists PC card events, such as insertion or removal. To control a card, press and hold down a card's Socket button. You'll see a small menu enabling you to reset, eject, or insert a card.

Configuring Network Information with COAS

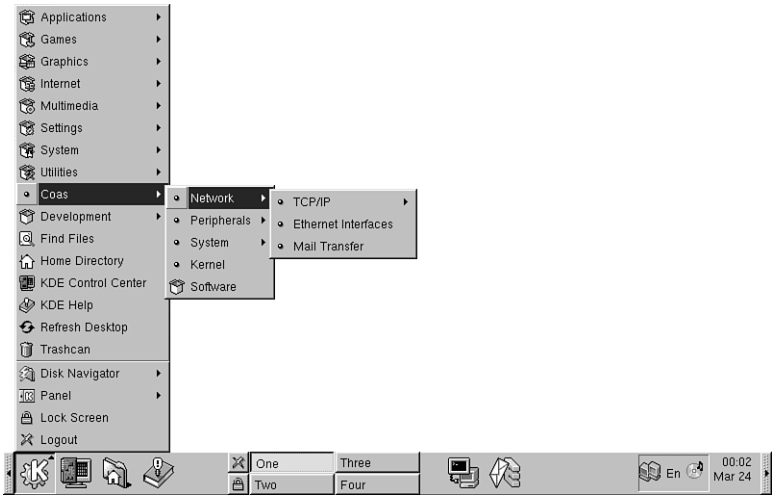
Although you were asked for network information during your OpenLinux installation, this is not your only opportunity to configure an interface. If you didn't enter network information during the installation, you don't have to perform a re-install just to configure networking! Use the COAS utility to configure your interface's address.

Configuring Your Ethernet Interface

To configure your interface, click the Application Starter button in your KDE desktop, select COAS and then Network, and click on Ethernet Interfaces, as shown in Figure 3.6.

FIGURE 3.6

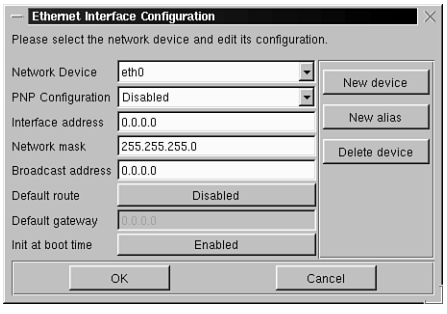
Use COAS to configure your Ethernet adapter under the K Desktop Environment.



You then see a welcome dialog box. Click the OK button (or press Enter) to continue. The Ethernet Interface Configuration dialog box appears, as shown in Figure 3.7.

FIGURE 3.7

The Ethernet Interface Configuration dialog box is used to set network devices, interface addresses, and other information.



To configure your interface, click in the Interface address field, and enter your computer's IP address (such as `192.168.1.20`). When you finish, click the OK button. The dialog box disappears. You can then check the status of your interface with the `ifconfig` command, like this:

```
# ifconfig
lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          UP LOOPBACK RUNNING  MTU:3924  Metric:1
          RX packets:56 errors:0 dropped:0 overruns:0 frame:0
          TX packets:56 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
```

```
eth0      Link encap:Ethernet  HWaddr 00:E0:98:04:AA:D5
          inet addr:192.1.2.34  Bcast:192.1.2.0  Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:5 errors:0 dropped:0 overruns:0 frame:0
          TX packets:5 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:100
          Interrupt:3 Base address:0x300
```

If you do not see an active local loopback (`lo`) interface, use the `ifconfig` command with the `lo` and `up` options like this:

```
# ifconfig lo up
```


As you can see, you now have an active Ethernet interface (`eth0`) and address (in this case, `192.1.2.34`). If you're connected to a local network, use the `ping` command to try to test your connection. Type `ping` on the command line of a terminal window, followed by the IP address of another computer, like this:

```
# ping 192.1.2.36
PING 192.1.2.36 (192.1.2.36): 56 data bytes
64 bytes from 192.1.2.36: icmp_seq=0 ttl=64 time=0.6 ms
64 bytes from 192.1.2.36: icmp_seq=1 ttl=64 time=0.5 ms
64 bytes from 192.1.2.36: icmp_seq=2 ttl=64 time=0.5 ms
64 bytes from 192.1.2.36: icmp_seq=3 ttl=64 time=0.5 ms
64 bytes from 192.1.2.36: icmp_seq=4 ttl=64 time=0.5 ms

--- 192.1.2.36 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max = 0.5/0.5/0.6 ms
```

Press Ctrl+C to stop the `ping` command, which sends and records the time it takes (in thousandths of a second) for a "packet" of 64 characters to be sent and echoed back from a remote computer. The remote computer can be on a local network or halfway across the world.

SETTING THE HOSTNAME

If you didn't set the hostname for your computer during the OpenLinux installation, you can add it later by using the Hostname menu item under the COAS System menu, or editing the file network under the `/etc/sysconfig` directory. To manually change your hostname, use your favorite text editor and open the `sysconfig` file (which should look like this):

```
NETWORKING="yes"
HOSTNAME=noname.nodomain.nowhere
```

Change the `HOSTNAME` entry to the hostname of your computer, save the file, and exit your editor. You can then verify your new hostname with the `hostname` command.

Using an Iomega Zip Drive with OpenLinux

There are now at least three different Iomega parallel-port Zip drives available for Linux (not including internal IDE, USB, or SCSI drives): the original Zip drive, the Zip Plus drive, and the new Zip 250.

For the very latest development information about Linux and parallel-port devices, such as the Zip drive, browse to `http://www.torque.net/linux-pp.html`.

The following steps (tested with an original Zip drive) will enable you to mount and use a Zip disk:

1. Turn on and connect your Zip drive to your computer's parallel port.
2. Insert a Zip disk into your Zip drive.
3. Create the directory (such as `/mnt/zip`) where you'd like to access the contents of your Zip disk, like this:

   ```
   # mkdir /mnt/zip
   ```

4. Use the `insmod` command to load kernel module support for the Zip drive, like this:

   ```
   # insmod scsi_mod
   # insmod sd_mod
   # insmod parport
   # insmod parport_pc
   # insmod ppa
   ```

This loads SCSI support (the Zip drive uses a low-level SCSI protocol), support for sharing the parallel port, and support for the Zip drive. After you load the `ppa` module, you should hear your Zip drive activate. You can then use the `mount` command, along with a filesystem type, device name (`/dev/sda`), and mount point, like this:

```
# mount -t vfat /dev/sda4 /mnt/zip
```

5. To unmount the Zip disk, use the `umount` command, followed by the mount point, like this:

```
# umount /mnt/zip
```

> Users of the Iomega Zip Plus or Zip 250 drive will need to use the `imm.o` module and will not be able to share the parallel port with a printer when using the Zip drive. If you use an original Zip parallel-port drive, you can use the Zip disk and print at the same time.

After you've verified that your Zip drive works, you can then use the Kernel utility under COAS to load your Zip drive's modules when booting.

Summary

This hour provided a step-by-step approach to configuring X11 for your computer's video card and monitor. Use this hour as the starting point for fine-tuning your X11 configuration.

Q&A

Q Help! My XFree86 only gives me a resolution of 320 by 200!

A It's possible that you picked the wrong resolution during your OpenLinux installation. Make sure to test various X11 modes during the OpenLinux install to get the best resolution possible with the most colors. You can also try reconfiguring X11 with the `xf86config` command and start X11 again. Pay close attention to the values you enter for your monitor's horizontal and vertical frequencies, and don't forget to edit your `XF86Config` file's `Device` section to set the correct amount of video RAM. If you have one of the latest and greatest video cards, the card might not be supported by XFree86 just yet. Chances are also good that the next release of XFree86's X11 distribution will contain fixes for your graphics cards.

Exercises

1. Start the `xvidtune` client , and then use its controls to fine-tune your X11 settings . See if you can get a better image on your display.
2. Try starting an X11 session at different color depths. Does your display look any different?
3. Try mounting, reading from, and writing to a Zip drive. Navigate to `http://www.torque.net/`.
4. Scroll through your `XF86Config` file while reading the `XF86Config` man page.

PART II
Learning Linux Basics

Hour

4 Reading and Navigation Commands

5 Manipulation and Searching Commands

6 Using the Shell

7 Using the X Window System

8 Exploring the K Desktop Environment

HOUR 4

Reading and Navigation Commands

This hour introduces you to the basic Linux commands used for navigating, searching, and reading files and directories of the *file system*, your Linux partition's collection of directories. After working through the material, you'll know how to get help on commands, find out where you are in Linux, and find files on your hard drive. The hour starts with navigating and searching your directory, and then moves on to show you how to read directories and files. But first, you'll learn how to help yourself with the `man` command.

Getting Help with the `man` Command

One of the first things to know about Linux is that help is never far away. Like most implementations of UNIX, your Linux distribution comes with manual pages for most programs, utilities, commands, and programming system calls. You can get information about nearly any command, including `man`. For example, read the manual page for the `man` command by typing the following:

```
# man man
```

Manual pages started as one-page UNIX command summaries. The file for each manual page is named with a single-digit extension and placed in a subdirectory under `/usr/man`. Manual pages for many OpenLinux commands are copied to your computer's hard drive during the initial installation process or when you later install an individual program. For example, the manual page for `man` is named and found as follows:

```
/usr/man/man1/man.1.gz
```

The name of the manual page for the `man` command is `man.1`, but the extension `.gz` indicates that the `man.1` file has been compressed with the `gzip` command. The `man` command automatically decompresses the file before displaying the manual page. For more information about compressed files, see the section "Compressing and Uncompressing Files" in Hour 5, "Manipulation and Searching Commands."

There are more than 1,000 manual page files under the `/usr/man/man1` directory. But if, for example, you want to understand the format and placement of manual pages, you don't find this information in `man.1` but in `man.7` under `/usr/man/man7`. Look at Table 4.1 to see the location and contents of each manual section.

TABLE 4.1 THE LINUX MANUAL SECTIONS

Directory	*Contents*
`/usr/man/man1`	Commands—Commands you run from within a shell
`/usr/man/man2`	System calls—Documentation for kernel functions
`/usr/man/man3`	Library calls—Manual pages for `libc` functions
`/usr/man/man4`	Special files—Information about files in the `/dev` directory
`/usr/man/man5`	File formats—Details of formats for `/etc/passwd` and other files
`/usr/man/man6`	Games
`/usr/man/man7`	Macro packages—Descriptions of the Linux file system, manual pages, and others
`/usr/man/man8`	System management—Manual pages for root operator utilities
`/usr/man/man9`	Kernel routines—Documentation on Linux kernel source routines or kernel module specifications

Each manual page traditionally has a number of sections; the documentation for the command also breaks down into sections. Look at Table 4.2 for the organization of a manual page.

TABLE 4.2 ORGANIZATION OF A MANUAL PAGE

Section	*Description*
Name	The name of the command and a brief description
Synopsis	How to use the command and command-line options
Description	An explanation of the program and its options
Files	A list of files used by the command and their location
See also	A list of related man pages
Diagnostics	A description of unusual output
Bugs	Known problems
Author	The program's main author and other contributors

Online manual pages contain special typesetting codes for the `nroff` text formatting program, using special macros(as documented in `man.7`) that control how the manual page is displayed or printed. For more information on the `nroff` text formatting program, see Hour 15, "Preparing Documents." The `nroff` format also is critically important for other programs, such as `makewhatis`, `whatis`, and `apropos`, which you'll learn about later in this chapter. These programs expect manual pages to have a consistent format so that information can be properly displayed during search operations or properly stored when building an information database about your OpenLinux system's programs.

You can also find more detailed documentation for Linux commands and other subjects under the `/usr/doc` directory, which contains files called Frequently Asked Questions, or FAQs, and How-To documents, or HOWTOs. Additionally, the Free Software Foundation, which releases the GNU software packages, puts much of its documentation in a special hypertext info format. Many of the commands discussed in this book are GNU programs.

Much of the software for Linux comes from the Free Software Foundation, founded by Richard Stallman, author of the `emacs` editor (see Hour 14, "Text Processing"). The FSF distributes its software under the GNU General Public License, or GPL. Part of the success and popularity of Linux and GNU software is because of the terms of the GPL. If you want more information about the GNU software programs for Linux, the FSF, or the GNU GPL, you can try the `info` command, which is a reader for the GNU hypertext documentation found under the `/usr/info` directory. You can also use the `man` command like so:

```
man GPL
```

The man command normally searches for manual pages according to instructions detailed in the man.conf file under the /etc directory. These instructions define the default directories in which to look for manual pages. The default places to look for these pages are as follows:

```
MANPATH /usr/man
MANPATH /usr/TeX/man
MANPATH /usr/local/man
MANPATH /usr/X11R6/man
MANPATH /usr/openwin/man
```

A graphic version of the man command, called xman, is available for the X Window System. You can use xman not only to read manual pages, but also to see directories of manual page entries. If you use the K Desktop Environment with X11 (introduced in Hour 8, "Exploring the K Desktop Environment"), you find that KDE manual pages are in Hypertext Markup Language, or HTML format.

Navigating and Searching the File System

This section introduces you to the basic navigational commands and shows you how to move around your Linux file system, find files, and build file information databases, such as those for use with the whatis command. You'll learn about alternative approaches and programs and how to speed up searches to find files quickly.

Moving to Different Directories with the cd Command

NEW TERM The cd (change directory) command is the basic navigation tool for moving to different parts of the Linux file system. After you log in to OpenLinux, you are in your home directory. This directory has a name, or *pathname*, beginning with /home/ followed by your username.

You can move directly to a different directory by typing the command followed by a pathname. For example, the following command moves you to the /usr/bin directory:

```
# cd /usr/bin
```

When you're in that directory, you can move up to the /usr directory with the following command:

```
# cd ..
```

You can also move to the root directory, or `/`, while in the `/usr/bin` directory by using the following command:

```
# cd ../..
```

Finally, you can always go back to your home directory (where your files are) by using the command

```
# cd
```

or

```
# cd ~
```

If you try to use the `man` command to read the `cd` man page, you won't find one. Why? Because `cd` is built into the shell, which interprets your command line after you press Enter. See `bash` in Hour 6, "Using the Shell," for more details.

Knowing Where You Are with the `pwd` Command

The `pwd` (print working directory) command tells you where you are and prints the working (current) directory. For example, if you execute

```
# cd /usr/bin
```

and then type

```
# pwd
```

you see

```
/usr/bin
```

Although there's a man page for the `pwd` command, chances are that when you use `pwd`, you're using a `pwd` built into your shell. How do you tell? If you try calling `pwd` with the following command, you see only the current working directory printed:

```
# pwd --help
```

Instead, try using the `pwd` command in the `/bin` directory as follows:

```
# /bin/pwd --help
```

This runs the `pwd` command in the `/bin` directory and not the `pwd` built into your shell. You see a short help file for the `pwd` command and not the current directory. If you're ever in doubt about where you are, use the `pwd` command under the `/bin` directory.

Searching Directories for Matching Files with the `find` Command

The `find` command is a powerful searching utility you can use to find files on your hard drive. You can search your hard drive for files easily with a simple `find` command line. For example, to search for the `spell` command under the `/usr` directory, you use the following:

```
# find /usr -name spell -print
```

You can use the `find` command to find files by date, and you can also specify a range of times. For example, to find programs in the `/usr/bin` directory that you have not used in the last 100 days, you can try the following:

```
# find /usr/bin -type f -atime +100 -print
```

The `-atime` option is followed by a number representing days. To find any files, either new or modified, that are one or fewer days old in the `/usr/bin` directory, you can use the following option:

```
# find /usr/bin -type f -mtime -1 -print
```

The `-mtime` option, followed by a number in days (in this case one or less), looks for modified files. The `find` command also accepts wildcards (such as `*` or `?`) in search strings, which you'll learn about in Hour 5. As a simple example, you can use `find` to show you all the PostScript files in your `/usr` directory with the following:

```
# find /usr -name '*.ps' -print
```

The section "Understanding Graphics Formats" in Hour 16, "Graphics Tools," covers PostScript files.

`-xdev` is one of the `find` command's handy options. The examples so far show searches limited to the `/usr` directory. But what if you want to search starting at the root (`/`) directory? `-xdev` limits searches to the current file system, which in this case is Linux. Without it, `find` merrily continues its search through any mounted CD-ROMs or your DOS or Windows partition, possibly finding files you're not interested in, slowing down the search, and cluttering up the search printout.

For example, you can use the `-xdev` option to limit your `find` command search to a Windows partition. To find all files ending in `.sys` on a mounted Windows partition under the `/mnt/dos` directory, use the `-xdev` option like this:

```
# find /mnt/dos -name *.sys -print -xdev
```

The `find` command has many different options and uses.

You can also send the find command on search-and-destroy missions to delete selected files from your computer. See "Saving Disk Space" in Hour 21, "Basic System Administration," for details.

Although `find` rapidly searches your hard drive and file systems, there are other ways of quickly finding files, especially programs. Read on to find out more!

Finding Files with the `whereis` Command

The `whereis` command can quickly find files, and it shows you where the file's binary, source, and manual pages reside. For example, the following command shows that the `find` command is in the `/usr/bin` directory, and its man page is in the `/usr/man/man1` directory:

```
# whereis find
find: /usr/bin/find /usr/man/man1/find.1.gz
```

You can also use `whereis` to find only the binary version of the program with the following:

```
# whereis -b find
find: /usr/bin/find
```

This is handy if you only want to see where a program is located and not its documentation. If `whereis` cannot find your request, you get an empty return string, for example:

```
# whereis foo
foo:
```

Part of the problem could also be that the file is not in any of the directories the `whereis` command searches. The directories `whereis` looks in are hard-coded into the program. Although this might seem like a drawback, limiting searches to known directories such as `/usr/man`, `/usr/bin`, or `/usr/sbin` can speed up the task of finding files.

Although `whereis` is faster than using `find` to locate programs or manual pages, there's an even faster search utility you can use, called `locate`, discussed in the next section.

Locating Files with the `locate` Command

One way to speed up searches for files is not to search your file directories! You can do this by using a program like `locate`. `locate` uses a single database of filenames and locations and saves time by looking in a single file instead of traversing your hard drive. Finding a file using `locate` is much faster than the `find` command because `locate` goes directly to the database file, finds any matching filenames, and displays its results.

`Locate` is easy to use. For example, to find all the PostScript files on your system, you can enter the following:

```
# locate *.ps
```

Almost instantly, the files appear on your screen. You might even find the `locate` command line a little easier to use than the `find` command. However, there is a catch: `find` works "right out of the box," whereas `locate` requires a database of all the files on your system. But don't worry—the procedure is almost automatic.

After you install OpenLinux, the `locate` database is updated every day at 5:50 a.m. To create an updated version of the `locate` database right away, you need to use the `updatedb` command. Make sure that you're logged in as the root operator, or use the `su` command (see Hour 21). At the prompt, enter the following:

```
# updatedb
```

It might take a minute or so for the `updatedb` command to finish its work, but when it's done, the database for `locate`, `locatedb`, resides in the `/var/state` directory. `locatedb` is about 700,000 characters in size for 900MB worth of files. The only downside to using the `locate` command is that over time, its database can become outdated as you add or delete files to your system. Fortunately, OpenLinux automatically updates the locate database; to find out how, see Hour 24, "Scheduling," for details.

Getting Command Summaries with `whatis` and `apropos`

As you first explore your OpenLinux system, you might come across programs whose function is not clear. Many Linux programs are designed to give at least a little help with a `?`, `-help` or `--help` option on the command line, but you generally shouldn't run a program without knowing what it does.

The `whatis` command might be able to help you quickly find out what a program is with a summary line derived from the program's manual page. For example, to find out what is `who`, you can enter the following:

```
# whatis who
```

Your screen clears, and the `whatis` command displays a summary like so:

```
who (1)     - show who is logged on
```

Press Q to quit the `whatis` command. However, unlike the `locate` command, you must first build a database of the command summaries with the `makewhatis` command, which is found under the `/usr/sbin` directory. To do this, make sure you're logged in as `root`, and enter the following:

```
# makewhatis
```

The `makewhatis` command, like the `updatedb` command, takes a few minutes to build the `whatis` database, which is called `whatis` and is found under the `/usr/man/man1` directory. The `makewhatis` command has several options but does not have a manual page. To see a quick summary, use the following:

```
# makewhatis -?
```


You need to periodically update the `whatis` database to keep track of any newly installed programs. See Hour 24 for tips on how to make OpenLinux do this automatically.

Now you see how `whereis` and `whatis` can help you find programs or figure out what they do. But what if you want to do something but can't remember which program does what? In this case, you can turn to the `apropos` command.

For example, if you can't remember which command searches for files, you can enter the following:

```
# apropos search
apropos (1)          - search the whatis database for strings
badblocks (8)        - search a device for bad blocks
bsearch (3)          - binary search of a sorted array.
conflict (8)         - search for alias/password conflicts
find (1)             - search for files in a directory hierarchy
hcreate, hdestroy, hsearch (3) - hash table management
lfind, lsearch (3)   - linear search of an array.
lkbib (1)            - search bibliographic databases
lookbib (1)          - search bibliographic databases
lsearch (n)          - See if a list contains a particular element
manpath (1)          - determine user's search path for man pages
strpbrk (3)          - search a string for any of a set of characters
strspn, strcspn (3)  - search a string for a set of characters
tsearch, tfind, tdelete, twalk (3) - manage a binary tree
```

```
whatis (1)           - search the whatis database for complete words.
zgrep (1)            - search possibly compressed files for
➥ a regular expression
zipgrep (1)          - search possibly zip files for

➥ a regular expression
```

You see a list of programs from the `whatis` database on your screen. Press the Q key when you finish reading the list. The `apropos` command uses this database to search for the keyword you entered. If you keep your `whatis` database up-to-date, you're able to use `apropos` to help you find the program you need.

You can also use the `man` command's `-K` option to do the same thing as `apropos`, but the search is slow and presents each manual page in the search result. For example, to search for any programs dealing with PostScript, you can try the following:

```
# man -K PostScript
```

This can result in the following output, before you quit with Q:

```
/usr/man/man7/unicode.7? [ynq] n
/usr/man/man7/suffixes.7? [ynq] n
/usr/man/man7/groff_char.7? [ynq] n
/usr/man/man1/convert.1x? [ynq] n
/usr/man/man1/xv.1? [ynq] n
/usr/man/man1/xdvi.1? [ynq] n
/usr/man/man1/dvips.1? [ynq] n
/usr/man/man1/afm2tfm.1? [ynq] n
/usr/man/man1/ps2pk.1? [ynq] n
/usr/man/man1/ps2frag.1? [ynq] q
```

Reading Directories and Files

Now that you know about directory navigation, searching for files, and how to find more information about programs, I'll introduce you to other basic Linux commands you can use. This section shows you how to list the contents of directories, make a catalog of your hard drive, and read the contents of files. You'll learn the basic forms of these commands to help get you started.

Listing Directories with the `ls` Command

The `ls` (list directory) command is one of the most often used programs. In its simplest form, `ls` lists nearly all the files in the current directory. But this command, which has such a short name, probably has more command-line options (more than 75 at last count) than any other program!

Why are there so many Linux commands, and why do they have such short names? If you're not familiar with Linux, you'll soon find hundreds of programs with short, initially cryptic names like `cd`, `pwd`, `df`, `du`, `ps`, `ls`, `as`, `ar`, `at`, `w`, and so on. Don't be intimidated! Instead, be thankful that Linux has inherited this rich assortment of traditional UNIX tools. The UNIX philosophy is that a good program is small and does one thing very well; the power of the operating system comes from combining the output of several programs in concert. Many of the command names were chosen to save typing. Why enter a long program name when one or two letters suffice? Also, many early UNIX users communicated with remote UNIX computers over very slow (110-baud) terminal lines, and short, precise commands were transmitted a lot faster. To better appreciate the short command names, read Hour 6.

In the simple form, `ls` lists the files in the current directory as in the following example:

```
[home/bball]$ ls
News            axhome          nsmail          search
author.msg      documents       reading         vultures.msg
auto            mail            research
```

The example lists files in my home directory.

You can also list the files as a single line, with comma separations, using the `-m` option:

```
# ls -m
News, author.msg, auto, axhome, documents, mail, nsmail, reading,
➥ research, search, vultures.msg
```

If you don't like this type of with the `ls` Commandlisting, you can have your files sorted horizontally, instead of vertically (the default) with the `-x` option, as follows:

```
# ls -x
News            author.msg      auto            axhome          documents
mail            nsmail          reading         research        search
vultures.msg
```

Are all these just files, or are there several directories? One way to find out is to use the `-F` option:

```
# ls -F
News/           axhome/         nsmail/         search*
author.msg      documents/      reading/        vultures.msg
auto/           mail/           research/
```

As you can see, the `-F` option causes the `ls` command to show the directories, each with a `/` character appended to the filename. The asterisk (`*`) shows that the file search is an executable program. But are these all the files in this directory? If you want to see everything, you can use the `-a` option with `-F`, as follows:

```
# ls -aF
./                .dt/               .neditdb          auto/
../               .dtprofile*        .netscape/        axhome/
.Xauthority       .festival_history  .newsrc           documents/
.Xdefaults        .forward           .oldnewsrc        mail/
.addressbook      .fvwm2rc95*        .pinerc           nsmail/
.addressbook.lu   .index/            .procmail/        reading/
.bash_history     .mailcap           .procmailrc       research/
.bash_logout      .mailrc            .tin/             search*
.bash_profile     .mime.types        .xinitrc*         vultures.msg
.bashrc           .ncftp/            News/
.desksetdefaults  .nedit             author.msg
```

As you can see, files or directories whose names begin with a period (`.`) are not displayed by `ls` unless you explicitly request all files. Using the `-F` option is one way to see the files and directories in your listings, but if you have a color monitor or use X11 in color, you can tell `ls` to show files, directories, or executable files in different colors. To do this, use the `--color` option like this:

```
# ls --color
```

In X11, using the `xterm` terminal, directories are blue, programs are green, and regular files are black. You can also customize which colors are used for different types of files.

For example, to have all graphics files, such as PCX or GIF graphics, appear in red and all text files ending in `.txt` appear in purple, create a shell *environment variable*, or system- or user-defined value, named `LS_COLORS`, define the colors, and export the variable like this:

```
# LS_COLORS="*pcx=31:*gif=31:*txt=35";export LS_COLORS
```

The `ls` man page lists the default colors. You can put your custom definition in your `.bashrc` file for use the next time you log in to OpenLinux. As the root operator, you can also specify systemwide default colors for all users. See Hour 6 to see how to define `LS_COLORS` and other environment variables for use by all users on your OpenLinux system.

Long Directory Listing

Would you like even more information about your files? You can use the long format listing by using the `ls -l` option, for example:

```
# ls -l
total 2086
-rw-r--r--   1 bball    users      256302 Dec 30 15:42 162317art.zip
drwx------   6 bball    users        1024 Dec 17 22:35 Desktop
drwxr-xr-x  24 bball    users        1024 Dec  2 15:09 Office40
```

```
drwxr-xr-x  22 bball    users        1024 Dec  2 11:23 Office50
-rw-r--r--   1 bball    users       29360 Dec 30 14:38 Sheet.as
-rw-r--r--   1 bball    users         705 Dec 30 15:15 Sheet.wk3
-rw-r--r--   1 bball    users        2360 Dec 30 15:15 Sheet.xl4
-rw-r--r--   1 bball    users        5632 Dec 30 15:20 Sheet.xl5
-rw-r--r--   1 bball    users        2958 Dec 17 20:37 XWp
drwxr-xr-x   5 bball    users        1024 Mar 24  1998 aim
drwxr-xr-x   4 bball    users        1024 Dec 30 15:15 axhome
drwxr-xr-x   2 bball    users        1024 Dec 23 23:15 documents
drwxr-xr-x   2 bball    users        1024 Dec 11 11:06 graphics
drwxr-xr-x   6 bball    users        1024 Dec  1 11:19 lg
drwxrwxrwt   2 bball    users        1024 Dec  9 16:34 mail
drwx------   2 bball    users        1024 Nov  8 10:56 nsmail
drwxr-xr-x   3 bball    users        1024 Nov 10 16:22 rvplayer5.0
drwxr-xr-x   5 bball    users        1024 Nov  4 10:49 so50
drwxr-xr-x   2 bball    users        3072 Dec 30 15:43 tyl2
-rwxr-xr-x   1 bball    users       12004 Dec 30 12:37 worth.as
-rw-r--r--   1 bball    users        1533 Dec 30 13:09 worth.csv
-rw-r--r--   1 bball    users      227985 Dec 30 13:08 worth.dif
-rw-r--r--   1 bball    users        4905 Dec 30 13:12 worth.sc
-rw-r--r--   1 bball    users        6110 Dec 30 13:09 worth.slk
-rw-r--r--   1 bball    users        1533 Dec 30 13:09 worth.txt
```

As you can see, there are eight different columns. The first column is the file's permission flags, which are covered in Hour 22, "Handling Files and Your File System." These flags generally show the file's type, and who can read, write (modify or delete), or run the file.

The next column shows the number of links, which are discussed in Hour 5. Next is the owner name, followed by the group name. Owners and groups are discussed in Hour 22. The file size is listed next, followed by a timestamp stating when the file or directory was created or last modified. The last column, obviously, is each file's name.

Specifying Other Directories

You can also use the `ls` command to view the contents of other directories by specifying the directory or pathname on the command line. For example, if you want to see all the files in the `/usr/bin` directory (you'll probably see a lot more than these), use the following:

```
# ls /usr/bin

arch          dd            gzip          netstat       stty
ash           df            hostname      nisdomainname su
awk           dmesg         kill          ping          sync
basename      dnsdomainname ksh           ps            tar
bash          doexec        ln            pwd           tcsh
bsh           domainname    login         red           touch
cat           echo          ls            rm            true
chgrp         ed            mail          rmdir         umount
chmod         egrep         mkdir         rpm           uname
```

```
chown          false          mknod          sed            ypdomainname
cp             fgrep          more           setserial      zcat
cpio           gawk           mount          sh
csh            grep           mt             sleep
date           gunzip         mv             sort
```

NEW TERM *Regular expressions* are a language of special string specification patterns. The `ls` command supports using wildcards and regular expressions, which means you can use options similar to and much more complex than the examples you saw with the `find` and `locate` commands. For example, if you only want to search for text files in the current directory, you can use the following:

```
# ls *.txt
```

Finally, if you want to see all the files on your system, you can use the `ls -R` option, which recursively descends directories to show you their contents. Although you can use this approach to search for files and build a catalog of the files on your system, be warned that it might take several minutes to list your files. The listing might also include files you don't want listed or files on other operating system file systems, such as DOS or Windows, especially if you use the following:

```
# ls -R /
```

A better approach might be to use the `-d` option with `-R` to list only a certain number of directory levels. For example, the following command searches three directory levels along the root (`/`) directory:

```
# ls -Rd /*/*/*
```

However, there's a much better utility for getting a picture of the directory structure of your system—`tree`—which is discussed in the following section.

Do you like how `ls -aF` shows your directories? Do you prefer `ls` to use colors all the time? If you want the `ls` command to always show this sort of detail, see Hour 6.

Listing Directories with the `dir` and `vdir` Commands

If you just can't get the hang of using `ls` to list your directories, you can use the `dir` or `vdir` commands. These commands have only about 45 command-line options compared to `ls`, but they're just as capable. They work like `ls` but with certain defaults.

The `dir` command works like the default `ls` command, listing the files in sorted columns as in the following example:

```
# dir
01_hyph.dat    49_thes.dat     bin           help           store
01_spell.dat   Desktop         config        install.ini    template
01_thes.dat    LICENSE         database      instdb.ins     wordbook
44_hyph.dat    README          download      kino           xp3
44_spell.dat   addin         explorer        l_soffice.xpm
44_thes.dat    autotext      filter          lib
49_hyph.dat    backup        fonts           s_soffice.xpm
49_spell.dat   basic         gallery         sofficerc
```

The `vdir` command works like the `ls -l` option and presents a long format listing by default as follows:

```
# vdir
total 3659
-rw-rw-rw-   1 bball    users       65605 Oct 27 10:00 01_hyph.dat
-rw-rw-rw-   1 bball    users      313015 Oct 27 10:00 01_spell.dat
-rw-rw-rw-   1 bball    users      375808 Oct 27 10:00 01_thes.dat
-rw-r--r--   1 bball    users       65605 Oct 27 10:00 44_hyph.dat
-rw-r--r--   1 bball    users      313015 Oct 27 10:00 44_spell.dat
-rw-r--r--   1 bball    users      380928 Oct 27 10:00 44_thes.dat
-rw-rw-rw-   1 bball    users       51765 Oct 27 10:00 49_hyph.dat
-rw-rw-rw-   1 bball    users      602497 Oct 27 10:00 49_spell.dat
-rw-rw-rw-   1 bball    users     1191936 Oct 27 10:00 49_thes.dat
drwxr-xr-x   2 bball    users        1024 Dec  2 11:21 Desktop
-rw-r--r--   1 bball    users       11631 Oct 27 10:00 LICENSE
-rw-r--r--   1 bball    users        8435 Oct 27 10:00 README
drwxr-xr-x   3 bball    users        1024 Dec  2 11:21 addin
drwxr-xr-x   2 bball    users        1024 Dec  2 11:21 autotext
drwxr-xr-x   2 bball    users        1024 Dec 30 15:41 backup
drwxr-xr-x   2 bball    users        1024 Dec 17 11:43 basic
drwxr-xr-x   2 bball    users        2048 Dec  2 11:22 bin
drwxr-xr-x  11 bball    users        3072 Jan  4 09:52 config
drwxr-xr-x   2 bball    users        1024 Dec  2 11:30 database
drwxr-xr-x   2 bball    users        1024 Dec  2 11:20 download
drwxr-xr-x   5 bball    users        1024 Dec  2 11:28 explorer
drwxr-xr-x   2 bball    users        1024 Dec  2 11:22 filter
drwxr-xr-x   4 bball    users        1024 Dec  2 11:20 fonts
drwxr-xr-x  14 bball    users        2048 Dec  2 11:22 gallery
drwxr-xr-x   4 bball    users        1024 Dec  2 11:21 help
-rwxr-xr-x   1 bball    users       15569 Dec  2 11:22 install.ini
-rw-r--r--   1 bball    users      274209 Dec 17 11:20 instdb.ins
drwxr-xr-x   2 bball    users        1024 Dec  2 11:21 kino
-rw-r--r--   1 bball    users        5199 Oct 27 10:00 l_soffice.xpm
drwxr-xr-x   2 bball    users        3072 Dec  2 11:21 lib
-rw-r--r--   1 bball    users         812 Oct 27 10:00 s_soffice.xpm
-rwxr-xr-x   1 bball    users        8406 Jan  4 09:52 sofficerc
drwxr-xr-x   3 bball    users        1024 Dec  2 11:38 store
```

```
drwxr-xr-x  13 bball    users        1024 Dec 17 11:43 template
drwxr-xr-x   2 bball    users        1024 Dec  2 12:08 wordbook
drwxr-xr-x   5 bball    users        1024 Dec  2 11:20 xp3
```

Although you don't find separate manual pages for `dir` or `vdir` (they're mentioned in the `ls` man page), you can get help with each command by using the `--help` option.

Listing and Combining Files with the `cat` Command

NEW TERM The `cat` (concatenate file) command is used to send the contents of files to your screen. You can also use this command to send files' contents into other files, too, using a process called *output redirection*. This section shows you some basic uses for this command. See Hour 6 for more about standard input, standard output, and redirection. Although `cat` can be useful for reading short files, it is usually used either to combine, create, overwrite, or append files. To use `cat` to look at a short file, you can enter the following:

```
# cat test.txt
This text file was created by the cat command.
Cat could be the world's simplest text editor.
If you read this book, you'll learn how to use cat.
This is the last line of text in this file.
```

The `cat` command also has a number of options. If you'd like to see your file with line numbers, perhaps to note a specific phrase, you can use the `-n` option:

```
# cat -n test.txt
     1  This text file was created by the cat command.
     2  Cat could be the world's simplest text editor.
     3  If you read this book, you'll learn how to use cat.
     4  This is the last line of text in this file.
```

You can also use `cat` to look at several files at once because `cat` accepts wildcards:

```
# cat -n test*
     1  This text file was created by the cat command.
     2  Cat could be the world's simplest text editor.
     3  If you read this book, you'll learn how to use cat.
     4  This is the last line of text in this file.
     5  This is the first line of test2.txt.
     6  This file was also created by cat.
     7  This is the last line of test2.txt.
```

As you can see, `cat` also includes a second file in its output and numbers each line of the output, not each file. Note that you can also see both files with the following:

```
# cat test.txt test2.txt
```

The output is exactly the same as if you used a wildcard.

But looking at several files is only one way to use `cat`. You can also use the `cat` command with the redirection operator (>) to combine files. For example, if you want to combine `test.txt` and `test2.txt` into a third file called `test3.txt`, you can use the following:

```
# cat test* > test3.txt
```

You can check the result as follows:

```
# ls -l test*
-rw-r--r--   1 bball    users         190 Jan  4 16:06 test.txt
-rw-r--r--   1 bball    users         108 Jan  4 16:07 test2.txt
-rw-r--r--   1 bball    users         298 Jan  4 16:07 test3.txt
```

But what if you want to combine `test.txt` and `test2.txt` without creating a larger, third file? In this case, you first decide whether you want the contents of `test.txt` to go into `test2.txt` or the contents of `test2.txt` to go into `test.txt`. Then, using `cat` with the >> redirection operator, you type the following:

```
# cat test.txt >> test2.txt
```

This appends the contents of `test.txt` to the end of the `test2.txt`. To check the results, use `cat` again:

```
# cat test2.txt
This is the first line of test2.txt.
This file was also created by cat.
This is the last line of test2.txt.
This text file was created by the cat command.
Cat could be the world's simplest text editor.
If you read this book, you'll learn how to use cat.
This is the last line of text in this file.
```

Note that you can instead enter the command as follows:

```
# cat -n test.txt >> test2.txt
```

Now the `test2.txt` file looks like this:

```
# cat test2.txt
This is the first line of test2.txt.
This file was also created by cat.
This is the last line of test2.txt.
     1  This text file was created by the cat command.
     2  Cat could be the world's simplest text editor.
     3  If you read this book, you'll learn how to use cat.
     4  This is the last line of text in this file.
```

Finally, here's a trick you can use if you want to create a short text file without running a word processor or text editor. Because the `cat` command can read the standard input, you can make the `cat` command create a file and fill it with your keystrokes. To do so, first type the following, using `myfile.txt` as the example file:

```
# cat > myfile.txt
```

Now enter some text, such as the following:

```
This is the cat word processor.
This is the end of the file.
```

Now press Ctrl+D to close the file. To see if this works, try the following:

```
# ls -l myfile.txt
-rw-r--r--   1 bball    users          61 Jan  4 16:11 myfile.txt

# cat myfile.txt
This is the cat word processor.
This is the end of the file.
```

The `cat` command prints out the contents of any file, not just text files. Although `cat` can be useful to look at one or several short files, what do you do when you want to read longer text files? Read on and learn about pager commands, which make life easier when reading longer files.

Reading Files with the `more` Command

NEW TERM The `more` command is one of a family of Linux commands called *pagers*. Pager commands let you browse through files, reading a screen or line at a time. This can be extremely helpful, especially if you read a lot of manual pages, because the `man` command uses a pager to display each page.

The `more` command is a traditional pager in the sense that it provides the basic features of early pagers. You can use `more` on the command line as follows:

```
# more longfile.txt
```

If you need help, you can press the H key to see a help screen. You can also run other commands from inside `more` by using the exclamation character (`!`). Reading through a text file is easy because you can advance one screen by pressing the Spacebar and go backward one screen by pressing the B key.

The `more` command also has a number of command-line options. You can customize the screen prompt (`more` displays the current percentage of the file you're reading), set the screen size (the number of lines shown when going forward or backward through your file), use multiple filenames or wildcards, and turn scrolling on or off, in addition to other options.

Although you might find the `more` command to be more than adequate in reading files, you might really like the `less` pager.

Browsing Files with the `less` Command

`less` is more or less like `more`, but `less` is also much more than `more`. Confused? Don't be, because `less`, like `more`, is also a pager command. Its author, Mark Nudelman, improved on a number of features in the `more` command and added many others.

The `less` command offers a number of advantages over `more`:

- You can scroll backwards and forwards through text files using your cursor keys.
- You can navigate through files with bookmarks by line numbers or by percentages of file.
- You have sophisticated searches, pattern options, and highlighting through multiple files.
- Keystrokes are compatible with word processing programs, such as `emacs`.
- The `less` command doesn't quit on you when you reach the end of a file or the end of the standard input.
- The information prompt at the bottom of the screen is more customizable and offers more information.
- There are loads of options, including a separate key setup program, `lesskey`, so you can customize which keys control `less`.

When you install Linux, the `less` pager is the default pager used by a number of programs, such as the `man` command. If you need to read compressed files (those with a `.gz` extension, and about which you'll learn in Hour 5), you can use the `zless` command found under the `/usr/bin` directory.

As an example, I first create a text file containing a list of all the OpenLinux commands in the `/usr/bin` directory with the `ls` command, as follows:

```
# ls /usr/bin >programs.txt
```

This command line creates a text file called `programs.txt`. To read this file, use the `less` command as in the following:

```
# less programs.txt
```

The `less` command loads the file and displays lines starting at the beginning of the file. To advance a single screen, press the Spacebar. To go back a single screen, press the B key. You can also use the cursor keys to move forward, backward, and even left and right! Normally, the `less` command prompt is a colon (`:`) at the bottom left of your screen. However, you can use the `-M` command-line option to view more information about your file, as follows:

```
# less -M programs.txt
```

Now when you browse through your file, the `less` command prints the file's name, the current and total line numbers, and a percentage number representing the current position in the file. The prompt looks something like the following:

```
programs.txt line 91/1221 8%
```

This shows that you're reading the file `programs.txt`, with the 91st line of 1221 lines displayed at the top of the screen. If you want to run another program, such as the `wc`, or word count program, type an exclamation mark, followed by your command line, and press Enter, as follows:

```
! wc programs.txt
```

The `wc` command echoes the number of lines, words, and characters for the file `programs.txt` back to your screen. After the command finishes, the `less` command prints the word `done` and asks you to press Enter.

You can also quickly search through a text file using a `less` search command. Press the forward slash (`/`) and then type part of a word or phrase. The `less` command searches through your file and highlights the first found instance of the search string. To search for the same phrase, just press `/` followed by the Enter key. To quit reading the file, press the Q key, and you return to your shell's command line.

Reading the Beginning or End of Files with the `head` and `tail` Commands

Although the `head` and `tail` commands are not pagers per se, they can make life a lot easier when all you want to do is read the beginning or end of a file. Although these programs, like most Linux commands, are designed to do only one or two things, they do these tasks well.

The `head` command has a number of options besides the traditional `-n` *x*, which prints the first *x* lines of a file. The `head` command in your Linux distribution, which is part of the GNU text utilities, also prints any number of 512-character, 1-kilobyte (1024 bytes), or megabyte-sized blocks from the beginning of a file. Like the `cat` command, `head` can

handle binary files.If you use `head` in the traditional way, you strip off lines from the beginning of one or several files. For example, if you want to see the first two lines of each HTML file for the Linux Installation Guide, use `head` with the option `-n 2`, followed by the path to the files, as follows:

```
# head -n 2 /usr/doc/LDP/install-guide/install-guide-3.2.html/*.html
==> /usr/doc/LDP/install-guide/install-guide-3.2.html/
➥footnode.html <==
<!DOCTYPE HTML PUBLIC "-//IETF//DTD HTML 2.0//EN">
<!--Converted with LaTeX2HTML 96.1-h (September 30, 1996) by Nikos
➥Drakos (nikos@cbl.leeds.ac.uk), CBLU, University of Leeds -->

==> /usr/doc/LDP/install-guide/install-guide-3.2.html/gs.html <==
<!DOCTYPE HTML PUBLIC "-//IETF//DTD HTML 2.0//EN">
<!--Converted with LaTeX2HTML 96.1-h (September 30, 1996) by Nikos
➥Drakos (nikos@cbl.leeds.ac.uk), CBLU, University of Leeds -->
```

Note that I only include the output for the first two files and that the default output from the `head` command is to include the filename (enclosed by `==>` and `<==`). If you prefer just to have the information with no filenames, use the `-q` option, as follows:

```
# head -n 2 /usr/doc/LDP/install-guide/install-guide-3.2.html/*.html
<!DOCTYPE HTML PUBLIC "-//IETF//DTD HTML 2.0//EN">
<!--Converted with LaTeX2HTML 96.1-h (September 30, 1996) by Nikos
➥Drakos (nikos@cbl.leeds.ac.uk), CBLU, University of Leeds -->

<!DOCTYPE HTML PUBLIC "-//IETF//DTD HTML 2.0//EN">
<!--Converted with LaTeX2HTML 96.1-h (September 30, 1996) by Nikos
➥Drakos (nikos@cbl.leeds.ac.uk), CBLU, University of Leeds -->
```

The `tail` command is especially useful when you face the task of reading through large files where the most useful information is at the end of the file. One example task is to look at the system messages for errors. One message file, located in `/var/log`, contains details of system operations, but the log is updated at the end of the message file. In other words, text is appended, so the most recent messages are at the end of the file. To look at the last 12 lines in the message file using `tail`, make sure you're logged in as root, and type the following:

```
# tail -n 12 /var/log/messages
Nov 12 21:02:02 localhost cardmgr[152]: initializing socket 0
Nov 12 21:02:02 localhost cardmgr[152]: socket 0: ATA/IDE
➥Fixed Disk Card
Nov 12 21:02:02 localhost cardmgr[152]: executing: 'insmod /
➥lib/modules/2.0.30/p
cmcia/fixed_cs.o'
Nov 12 21:02:03 localhost kernel: hdc: SunDisk SDCFB-4,
➥ 3MB w/1kB Cache, LBA, CH
S=123/2/32
Nov 12 21:02:03 localhost kernel: ide1 at 0x100-0x107,0x10e on irq 3
```

```
Nov 12 21:02:03 localhost kernel:  hdc: hdc1
Nov 12 21:02:03 localhost cardmgr[152]: executing:
➥'./fixed start hdc'
Nov 12 21:02:03 localhost cardmgr[152]: initializing socket 1
Nov 12 21:02:03 localhost cardmgr[152]: socket 1: Serial or
➥Modem Card
Nov 12 21:02:03 localhost kernel: tty01 at 0x02f8 (irq = 5)
➥is a 16550A
Nov 12 21:02:03 localhost cardmgr[152]: executing:
➥'insmod /lib/modules/2.0.30/p
cmcia/serial_cs.o'
Nov 12 21:30:17 localhost PAM_pwdb[556]: (su) session opened
➥for user root by bball(uid=0)
```

If you try this example, OpenLinux might report the following:

```
tail: /var/log/messages: Permission denied
```

This means that you're not logged in as the root operator! For security reasons, OpenLinux prevents casual users from reading your system logs. Instead, try using the `su` command as follows:

```
su -c "tail -n 12 /var/log/messages
```

After you press Enter, `su` asks for the root password. Type in the root operator's password and press Enter again to see the information. This is a handy way to run commands as root.

Being able to read large files in this way is convenient, considering that the system messages can grow to more than a million characters.

Summary

This hour introduces more than a dozen basic commands you use during your OpenLinux sessions. Knowing how to get help, read files, list directories, and navigate through your file system are important skills. You use many of these commands repeatedly as you learn how to use OpenLinux.

Q&A

Q **I've found files with names like `README` under different directories under the `/usr/doc` directory. How do I read a `README` file?**

A Use the `less` pager from the command line, followed by the complete pathname to the desired file. For example, to read the `README` file for the `pdksh` shell, type a command line with `less` as follows and press Enter:

```
less /usr/doc/pdksh-5.2.13/README
```

Q **Some pathnames are really long! Is there an easier way to read or list a file?**

A Using the previous example, you can use an asterisk (`*`) in the pathname as follows:

```
less /usr/doc/pdksh*/README.
```

Q **I typed the previous example but used an asterisk as follows:**

```
less /usr/doc/p*/README
```

The `less` command says that it is reading file 1 of 25! What happened, and how do I read the other files?

A There are at least 37 different directories under the `/usr/doc` directory with names that begin with the letter `p`. Obviously, 25 of these directories contain a file called `README`. In the `less` pager, to jump to the next file, type a colon (`:`) and press the N key.

Q **How do I list just directory names? For example, I want to see the names of all directories under the `/usr/doc directory` that begin with the letter `z`.**

A Use the `-d`, or directory command-line option with the `ls` command. To see all the directories with names beginning with the letter `z`, type the command as follows:

```
ls -d /usr/doc/z*
```

Exercises

1. Use the `cd` command to go to the `/usr/bin` directory. Then type `cd` and press Enter. Where are you?
2. Again, use the `cd` command, but this time go to the `/` directory. Type `cd ~` and press Enter. Next, type `cd -` and press Enter. Where are you?
3. The `cat` command's `-n` option numbers lines displayed to your screen. How can you number lines in files you read with the `less` command?

HOUR 5

Manipulation and Searching Commands

In this hour, you'll learn about creating, copying, deleting, and moving files and directories. You'll also learn about searching files and how to compress and decompress files. This information builds on information you learned in the preceding hour, and the commands you learn here are used later in this book.

Manipulating Files or Directories

Using Linux isn't different from using any other computer operating system. You create, delete, and move files on your hard drive in order to organize your information. This section shows you how to do these tasks quickly and easily.

Although the graphical interface for Linux, the X Window System, might offer drag-and-drop capabilities or multiple selections in order to copy or delete files, many of the commands you learn here form the base of these operations. It is worth knowing how these programs work, even if you don't use Linux in the console mode.

Creating Files with the `touch` Command

The `touch` command is easy to use, and generally, there are two reasons to use it. The first reason is to create a file, and the second is to update a file's modification date. The `touch` command is part of the GNU file utilities package and has several options.

To create a file with `touch`, use the following:

```
# touch newfile
# ls -l newfile
-rw-r--r--   1 bball    users           0 Jan  5 12:40 newfile
```

As you can see, `touch` creates a file with a length, or size, of zero. You can also use the following:

```
# > newfile2
# ls -l new*
-rw-r--r--   1 bball    users           0 Jan  5 12:40 newfile
-rw-r--r--   1 bball    users           0 Jan  5 12:41 newfile2
```

Like `touch`, this creates a file with a length of zero. So why use `touch` if you can do this at the command line? Because `touch` can update a file's date or time. You can even use `touch` to change a file's date or time to the past or the future, for example:

```
# touch newfile2
# ls -l newfile2
-rw-r--r--   1 bball    users           0 Jan  5 12:44 newfile2
```

As you can see, the file `newfile2` now has a timestamp 3 minutes younger (12:44 instead of 12:41). You can also set the time and date of a file to an arbitrary time and date by using the touch command's `-t` option, followed by a string of numbers representing the month, day, time, and year, for example:

```
# touch -t 1225130000 newfile2
# ls -l --full-time new*
-rw-r--r--   1 bball    users      0 Tue Jan 05 12:40:14 1999 newfile
-rw-r--r--   1 bball    users      0 Mon Dec 25 13:00:00 2000 newfile2
```

The `--full-time` option and long format listing of the `ls` command show that the file `newfile2` now has a timestamp of 1 p.m., Christmas Day, 2000 (which appears to be, and is indeed, a Monday).

One use for `touch` is during backup operations. Either before or after backing up a series of files or directories, you can use `touch` to update the timestamps of your files so that the backup program has a reference time for the next backup session. Another use for `touch` is to either delete or retain log files on your system during automated file cleanup by scheduled programs managed by `cron` (see the section "Using the `cron` Daemon" in Hour 24, "Using Scheduling to Automate System Management"). If you make a log file old enough, it is deleted. If you update it, the file is retained.

Deleting Files with the `rm` Command

The `rm` command deletes files. This command has several simple options but should be used cautiously. Why? Because when `rm` deletes a file, it is gone. (You might be able to recover portions of text files, though; see the `mc` command later this hour for pointers.)

Always running Linux while logged in as the root operator and using the `rm` command has caused many untold tales of woe and grief. Why? Because with one simple command, you can wipe out not only your Linux system, but also any mounted file systems including DOS partitions, flash RAM cards, or removable hard drives, as follows:

```
# rm -fr /*
```

This command removes all files and directories recursively with the `-r` option, starting at the root (`/`) directory. If you must run Linux as root, make sure to back up your system, and read Hour 23, "Backing Up and Restoring Your System."

The `rm` command deletes one or several files from the command line. You can use any of the following:

```
# rm file
# rm file1 file2 file3
# rm file*
```

The first command line deletes a single file named `file`, the second command line deletes three files, and the third command line deletes any file in the current directory with a filename beginning with the letters `file`. One of the safer ways to use `rm` is through the `-i`, or interactive, option where you're asked if you want to delete the file, for example:

```
# rm -i new*
rm: remove `newfile'? y
rm: remove `newfile2'? y
```

You can also force file deletion by using the `-f` option, as in the following:

```
# rm -f new*
```

If you use the `-f` option and no files match the `new*` pattern, the `rm` command fails without displaying an error message. However, if `rm` finds a directory, even if it is empty, it does not delete the directory, and it complains, even if you use `-f`, as in the following:

```
# rm -f temp*
rm: temp: is a directory
rm: temp2: is a directory
```

When you combine the `-f` and `-r` options, you can delete directories and all files or directories found within, provided you own them or have permission; see Hour 22, "Handling Files and Your File System." `-f` and `-r` can be combined as in the following example:

```
# rm -fr temp*
```

The `-fr` option also makes `rm` act like the `rmdir` command (discussed later this hour). Be extremely careful when you use this option! Generally, when you delete a file in OpenLinux, the file is gone forever!

Some X window environments, such as KDE, or productivity suites, like StarOffice, offer "trash can" approaches to deleting files—files are not really deleted, just moved to a temporary directory. This is a safe, but not fail-safe, approach to deleting or recovering files. If you really need help with recovering a file, you might be able to use the `mc`, or Midnight Commander, command discussed later this hour.

Creating Directories with the `mkdir` Command

Use the `mkdir` command to create one or several directories. You might be surprised to know that `mkdir` can also create a whole hierarchy of directories, including parents and children, with a single command line.

This command is one of the basic tools, along with `cp` and `mv`, you can use to organize your information. Take a look at some examples. The following simple command line creates a single directory:

```
# mkdir temp
```

But you can also create multiple directories, as follows:

```
# mkdir temp2 temp3 temp4
```

You can also type the following to make a directory named `child` under `temp`:

```
# mkdir temp/child
```

This works because the `temp` directory exists (you just created it). But, suppose you type the following:

```
# mkdir temp5/child
mkdir: cannot make directory `temp5/child': No such file or directory
```

As you can see, `mkdir` complains because the `temp5` directory does not exist. To build a hierarchy of directories with `mkdir`, you must use the `-p`, or parent, option, as in the following example:

```
# mkdir -p temp5/parent/child
# tree temp5
temp5
`-- parent
    `-- child

2 directories, 0 files
```

As you can see, not only does `mkdir` create the `temp5` directory, but also a subdirectory called `parent`, and a subdirectory under parent called `child`.

Now that you know how to create directories, take a look at how to remove them.

Removing Directories with the `rmdir` Command

The `rmdir` command removes directories. To remove a directory, all you have to do is type the following:

```
# rmdir tempdirectory
```

But there's a catch: the directory must be empty first! If you try to delete a directory containing any files, you get an error message like this:

```
# rmdir temp5
rmdir: temp5: Directory not empty
```

In this example, `temp5` contains other directories. The `rmdir` command also complains if a directory contains only files and not directories. You can use the `rm` command to remove the files first (remember to be careful if you use the `-fr` option), move the files somewhere else, or rename the directory with the `mv` command, which is discussed next.

The `rmdir` command, like `mkdir`, has a `-p` option. You can use this option to remove directory hierarchies, as follows:

```
# rmdir -p temp5
rmdir: temp5: Directory not empty
```

Hmm… That doesn't work! How about the following:

```
# rmdir -p temp5/parent
rmdir: temp5/parent: Directory not empty
```

Hey! That doesn't work either. Now try this:

```
# rmdir -p temp5/*
rmdir: temp5/parent: Directory not empty
```

This is getting frustrating! Try it one more time:

```
# rmdir -p temp5/parent/child
```

Finally! As you can see, you must specify the complete directory tree to delete it. If you use the same command line without the `-p` option, only the child directory is deleted. But what if there are two or more subdirectories, as in the following example:

```
# mkdir -p temp5/parent/child
# mkdir temp5/parent/child2
# tree temp5
temp5
`-- parent
    |-- child
    `-- child2

3 directories, 0 files
```

In order to delete the entire directory system of `temp5`, you need to use the following:

```
# rmdir temp5/parent/*
```

Now you know how to create and remove directories. Next, you learn about the `mv` command, which you can use to move or rename files and directories.

Renaming Files with the `mv` Command

The `mv` command, called the rename command, indeed renames files or directories—but it is also known to many as a move command that moves files or directories around your file system.

Actually, in the technical sense, the files or directories are not really moved. If you insist on knowing all the gory details, read the *Linux System Administrator's Guide*, or the SAG, available through the following site:

`http://metalab.unc.edu/LDP/LDP/sag/index.html`

Don't want to read the SAG online? You can probably find a copy installed on your OpenLinux system. Try using the lynx text-only web browser, as follows:

```
lynx /usr/doc/LDP/system-admin-guide/sag-0.6-html/sag.html
```

For more information about using the lynx browser, see Hour 13, "Internet Downloading and Browsing."

In its simplest form, `mv` can rename files, for example:

```
# touch file1
# mv file1 file2
```

This command renames `file1` to `file2`. Besides renaming files, `mv` can rename directories, whether they are empty or not. For example, even if you create a directory structure with the `mkdir` command, you can use the `mv` command to rename the new top-level directory, like so:

```
# mkdir -p temp/temp2/temp3
# mv temp newtemp
```

Although `mv` has nine different options, this section concentrates on the two most commonly used, `-b` (backup) and `-i` (interactive). These options enable you to use `mv` in a fairly safe way—`mv` not only renames but also overwrites quickly and silently (without asking)! The first option, `-b`, creates a backup of any file or directory you rename to an existing name, for example:

```
# touch uno deux tres
# ls uno deux tres
deux  tres  uno
# mv uno deux
# ls uno deux tres
ls: uno: No such file or directory
deux  tres
```

As you can see, without using `-b`, `mv` not only renames the file `uno` to `deux`, but deletes the file `deux` in the process. Is this dangerous? You bet! Now, try the `-b` option:

```
# touch uno
# ls uno deux tres
deux  tres  uno
# mv -b uno deux
# ls deux* tres
deux   deux~  tres
```

This example shows that although the file `uno` is renamed replacing the file `deux`, a backup of `deux` with a default extension of the tilde (~) is created.

The `mv` command can work silently, or as with `rm`, you can use the `-i` option, for example:

```
# touch file2 file3
# mv file2 file3
# touch file2
# mv -i file2 file3
mv: replace `file3'? y
```

Here, I create two files, and then rename the file `file2` to `file3`, which deletes the original `file3`. However, I then use the `-i` option, and the `mv` command asks if I want to overwrite the file. The `mv` command does not ask for permission if no overwriting takes place, even if you use `-i`. You can also combine the `-b` and `-i` options as follows:

```
# mv -bi file2 file3
```

Now that you know how to delete, rename, or move your files, how do you copy files?

Copying with the `cp` Command

The `cp`, or copy, command copies files or directories. This command has nearly 40 command-line options. They aren't all covered here, but you learn about some of the most commonly used options, which save you time and trouble.

You'll most likely first use `cp` in its simplest form, for example:

```
# cp file1 file2
```

This copies `file1` to create `file2` and, unlike `mv`, leaves `file1` in place. But you must be careful when using `cp` because you can copy a file onto a second file, effectively replacing it! In this regard, `cp` can act like `mv`. To show you how this can happen, try creating three files, each with a line of text, using the `cat` command:

```
# cat > file1
this is file1
# cat > file2
this is file 2
# cat > file3
this is the third file
# ls -l file*
-rw-r--r--   1 bball    users          14 Jan  5 13:29 file1
-rw-r--r--   1 bball    users          15 Jan  5 13:29 file2
-rw-r--r--   1 bball    users          23 Jan  5 13:29 file3
```

Now, copy a file onto another file, and then check the file sizes and the contents of the new file, as follows:

```
# cp file1 file2
# ls -l file*
-rw-r--r--   1 bball    users          14 Jan  5 13:29 file1
-rw-r--r--   1 bball    users          14 Jan  5 13:31 file2
-rw-r--r--   1 bball    users          23 Jan  5 13:29 file3
# cat file2
this is file1
```

It should be obvious that `file1` replaces `file2`. To avoid this problem (unless you really want to overwrite the file), you can use the `-b` or `-i` options, which work like `mv`. Here's an example:

```
# cp -i file1 file2
cp: overwrite `file2'? n
# cp -bi file1 file2
cp: overwrite `file2'? y
# ls file*
file1   file2   file2~  file3
```

Note that `file2`, which is overwritten, is backed up.

The `cp` command can also copy a number of files at one time. The following example shows how to copy all the files in directory `tempdir1` to directory `tempdir2`:

```
# cp tempdir1/* tempdir2
# tree tempdir2
tempdir2
¦-- temp1file1
¦-- temp1file2
`-- temp1file3

0 directories, 3 files
```

Like the `rm` command, `cp` also has an `-r`, or recursive, option. You can use this option to copy one directory into another. For example, to copy the `tempdir1` directory and its files into `tempdir2`, use this syntax:

```
# cp -r tempdir1 tempdir2
# tree tempdir2
tempdir2
¦-- temp1file1
¦-- temp1file2
¦-- temp1file3
`-- tempdir1
    ¦-- temp1file1
    ¦-- temp1file2
    `-- temp1file3

1 directory, 6 files
```

Finally, the `cp` command has the `-p` option, which is similar to `mkdir`'s `-p` option. Normally, when you copy a file inside several directories into another directory, only the file is copied. The following example only copies `temp1file1` into `tempdir3`:

```
# tree tempdir2
tempdir2
¦-- temp1file1
¦-- temp1file2
¦-- temp1file3
`-- tempdir1
    ¦-- temp1file1
    ¦-- temp1file2
    `-- temp1file3

1 directory, 6 files
# cp tempdir2/tempdir1/temp1file1 tempdir3
```

However, what if you want to copy a file along with its directory structure? To do this, you can use the `-P` option:

```
# cp -P tempdir2/tempdir1/temp1file1 tempdir3
# tree tempdir3
tempdir3
`-- tempdir2
    `-- tempdir1
        `-- temp1file1

2 directories, 1 file
```

Not only does `cp` copy the single file, but it has also creates the subdirectory structure.

Creating Hard and Symbolic Links with the `ln` Command

Linux supports both hard and symbolic links. Although it is not important that you understand how links in Linux work, you need to understand the difference between these two types of links, and how to use links while you use Linux. To create hard or symbolic links, use the `ln`, or link, command.

NEW TERM The `ln` command creates both types of links and links files with other files (including directories, which under OpenLinux are simply files, too). The important difference is that *hard* links directly link two files on only the same file system. On the other hand, you can use a *symbolic* link between directories or files that span different file systems. Hard links also have other advantages. If you use the `ln` command to create a hard link, you specify a second file on the command line you can use to reference the original file, as in the following example:

```
# cat > file1
This is file1
# ln file1 file2
# ls -l file*
-rw-r--r--   2 bball    users          14 Jan  5 13:32 file1
-rw-r--r--   2 bball    users          14 Jan  5 13:32 file2

# cat file2
This is file1
```

You can see that `file2` is exactly the same as `file1`. If you delete `file1`, `file2` remains. If you make changes to `file1`, such as adding text, these changes appear in `file2`, and if you make changes to `file2`, `file1` is also updated. Although you can see two files, each 14 characters in size, only 14 characters of hard drive space are used for the original file (okay, technically more than that, but it depends on the block size of the partition or type of hard drive).

On the other hand, although symbolic links are useful, they have a drawback. The next examples show you why. First, to create a symbolic link, use the `ln` command's `-s` option:

```
# cat >file1
This is file1
# ln -s file1 file2
# ls -l file*
-rw-r--r--   1 bball    users          14 Jan  5 13:48 file1
lrwxrwxrwx   1 bball    users           5 Jan  5 13:48 file2 -> file1
```

Note the arrow pointing from `file2` to `file1`. This tells you that `file2` is a symbolic link to `file1`. Also note that `file2` is smaller in length than `file1`. Symbolic links are different from hard links in that a symbolic link is merely an alias for the original file. Nothing happens to the original file if you delete the symbolic link. However, if you delete the original file, your symbolic link can't help you at all:

```
# rm -f file1
# cat file2
cat: file2: No such file or directory
```

Because the original file, `file1`, no longer exists, you can't access its contents through the symbolic link, `file2`. However, symbolic links do have an advantage over hard links. You can use a symbolic link to point to a directory on your OpenLinux file system or even another file system. In the following example, if you try to create a hard link to the `/usr/local/games` directory, the `ln` command complains and quits:

```
# ln /usr/local/games play
ln: /usr/local/games: hard link not allowed for directory
```

But you can use a symbolic link, as follows:

```
# ln -s /usr/local/games play
# ls -l play
lrwxrwxrwx  1 bball  users   16 Jan  5 14:12 play -> /usr/local/games
```

Now, instead of typing a long command like

```
# cd /usr/local/games
```

you can use

```
# cd play
```

Symbolic links to other directories on other file systems, such as a DOS or Windows partition, can be handy. For example, having a directory called `dos` in your home directory that is linked to `/mnt/dos/windows/desktop` makes copying or moving files to and from Linux and Windows a lot easier. For example, if you want to have a linked directory named `dos` in your home directory and your DOS file system is mounted under the `/mnt/dos` directory, first make sure that the DOS file system is mounted, and then use the `ln` command to create a symbolic link, like so:

```
# ln -s /mnt/dos/windows/desktop dos
```

See Hour 22 for details about mounting other file systems.

So far, you've learned about using the command line. If you're familiar with more graphical interfaces for manipulating files, you'll like the next program, `mc`.

Handling Files with the Midnight Commander Program

The `mc` program, called Midnight Commander, is a graphical interface for handling files (see Figure 5.1). It is a visual shell (you'll learn more about shells in the next hour, "Using the Shell"). To start `mc`, type the following at the command line:

```
# mc
```

This section does not cover all the details of the `mc` program. Here are the highlights of its features:

- Provides a visual interface to two directories at a time
- Enables directory browsing with mouse clicks
- Enables menu-driven file operations with dialog boxes, mouse, keyboard and function key support

- Has an open command line to your shell
- Runs commands through mouse clicks
- Has extensive, built-in hypertext help screens
- Emulates and supports the `ls`, `cp`, `ln`, `mv`, `mkdir`, `rmdir`, `rm`, `cd`, `pwd`, `find`, `chown`, `chgrp`, and `tree` commands
- Compares directory contents
- Uses customized menus so you can build your own commands
- Can use network links for telnet or FTP operations (see Hour 13)
- Offers mouse-click decompression of files (see the section "Compressing Files with the `gzip` Command" later this hour)
- Can undelete files if your Linux file system is configured to support this capability

Midnight Commander is a handy and convenient tool to use for file handling and directory navigation. You have to invest some time learning how to use this program, but if you've used similar file-management interfaces, you'll feel right at home.

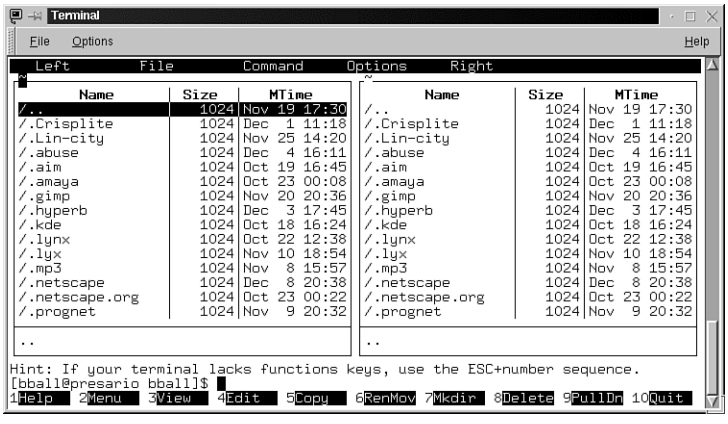

Terminal
File Options Help
Left File Command Options Right
Name Size MTime
/.. 1024 Nov 19 17:30
/.Crisplite 1024 Dec 1 11:18
/.Lin-city 1024 Nov 25 14:20
/.abuse 1024 Dec 4 16:11
/.aim 1024 Oct 19 16:45
/.amaya 1024 Oct 23 00:08
/.gimp 1024 Nov 20 20:36
/.hyperb 1024 Dec 3 17:45
/.kde 1024 Oct 18 16:24
/.lynx 1024 Oct 22 12:38
/.lyx 1024 Nov 10 18:54
/.mp3 1024 Nov 8 15:57
/.netscape 1024 Dec 8 20:38
/.netscape.org 1024 Oct 23 00:22
/.prognet 1024 Nov 9 20:32
..
Hint: If your terminal lacks functions keys, use the ESC+number sequence.
[bball@presario bball]$
1Help 2Menu 3View 4Edit 5Copy 6RenMov 7Mkdir 8Delete 9PullDn 10Quit

FIGURE 5.1

The Midnight Commander visual shell displays a graphical interface to Linux file commands.

Searching Files

This section introduces you to the use of sophisticated wildcards, or regular expressions, along with short examples of file searches using the `grep` family of programs. If you understand and use these expressions, you can create refined search techniques you can use again and again. You'll save time and effort during your work, and your learning investment will pay big dividends throughout your Linux experience.

What Are Regular Expressions?

NEW TERM *Regular expressions* are patterns that use special syntax to match strings (usually in text in files, unless your search is for filenames). There are also extended regular expressions that can use additional operators in the search patterns. The difference, important for syntax, should not deter you from learning how to construct patterns that accurately match your desired search targets. This is important if you're looking for text in files and critical if you're performing potentially dangerous tasks, such as multiple file deletions across your system.

You can build an infinite number of regular expressions using only a small subset of pattern characters. Table 5.1 contains a short list of some of these characters. You should be familiar with at least one (the asterisk) from the previous examples.

TABLE 5.1 COMMON REGULAR EXPRESSIONS

Expression	*Matching*
`*`	Any character
`?` or `.`	A single character
`{`*x*`}`	Preceding character *x* times
`{`*x*`,`*y*`}`	Preceding character at least *x* times but no more than *y*
`{`*x*`,}`	Preceding character at least *x* times
`(`*xxx*`)¦(`*XXX*`)`	String *xxx* or *XXX*
`[`*xxx*`]` or `[`*x*`-`*x*`]`	A character in a range of characters
`[`*XYZ*`]+`	*X*, *Y*, or *Z* at least once
`\`*x*	A character such as `?` or `\`
`^`*pattern*	*pattern* at the beginning of a line
`$`*pattern*	*pattern* at the end of a line

This is not a comprehensive list of pattern characters. For more details, you can read the `ed` manual page (the `ed` command is discussed in Hour 14, "Text Processing"). For now, try several simple examples using different patterns.

The asterisk is useful for finding matches to all characters. For example, if you want to find all the text files in your directory with an extension of `.txt`, you can use the following:

```
# ls *.txt
14days.txt    96hours.txt   datalog.txt   datebook.txt  day67.txt
```

But suppose you want a list of all the ?files in your directory with numbers in the filename? You can try to string multiple searches on the `ls` command line, like this:

```
# ls *0* *1* *2* *3* *4* *5* *6* *7* *8* *9*
08100097.db      14days.txt       backup001.file   phonelog.111597
08100097.db      32days.msg       day67.txt        phonelog.111597
08100097.db      32days.msg       day67.txt        phonelog.111597
08100097.db      96hours.txt      message.76
08100097.db      96hours.txt      message.76
14days.txt       backup001.file   phonelog.111597
```

Obviously, this is not the result you want because the multiple searches have printed duplicate filenames. To find exactly what you want, use a regular expression that tells `ls` to list any file that has a number appearing in the file's name, as follows:

```
# ls *[0123456789]*
0001file.0009    32days.msg       day67.txt
08100097.db      96hours.txt      message.76
14days.txt       backup001.file   phonelog.111597
```

This shows all the files containing numbers in the filename because you specify a range of characters or, in this case, numbers in your search pattern. You can also use a regular expression shorthand to build a shorter expression to do the same thing, for example:

```
# ls *[0-9]*
0001file.0009    32days.msg       day67.txt
08100097.db      96hours.txt      message.76
14days.txt       backup001.file   phonelog.111597
```

How you specify your pattern characters in your expression is important. If you only want a list of files ending in a number, you can use the following:

```
# ls *[0-9]
0001file.0009    message.76       phonelog.111597
```

If you only want a list of files beginning with a number, you can use this:

```
# ls [0-9]*
0001file.0009  08100097.db    14days.txt    32days.msg    96hours.txt
```

Here's a fun exercise: What if you want to list those files with numbers only inside or on both ends of a filename? Try these:

```
# ls *[-a-z][0-9]*
backup001.file  day67.txt
# ls [0-9]*[a-z]*[0-9]
0001file.0009
```

Finally, how do you match patterns when the pattern you're looking for contains a pattern-matching character? Easy! Use the backslash to *escape* the character, for example:

```
#  ls *\?*
cathy?.message
```

As you can see, using regular ?expressions can take some practice, b-ut your efforts are well rewarded. Try experimenting with different expressions to see if you can come up with results similar to the examples shown in this section.

Searching Inside Files with the `grep` Commands

This section introduces you to the family of `grep` commands. You'll learn about `grep`, `egrep`, and `fgrep`. In order to use these commands, you should know how to use some of the pattern-matching techniques already discussed. You'll use these commands to search through files and extract text. Each of these programs works by searching each line in a file. You can search single files or a range of files.

Each of the `grep` commands is basically the same and has nearly 20 different command-line options. The only real difference is that `egrep` uses a slightly different syntax for its pattern matching, whereas `fgrep` uses fixed strings. You'll see examples of each program and use some of the common options. For specific details about the pattern-matching capabilities of these programs, see the `grep` manual page.

To show you the difference in each program's search pattern syntax, I'll look for different patterns in Matt Welsh's *Linux Basic Installation Guide* (available at `http://metalab.unc.edu/LDP` or on your OpenLinux system in the `/usr/doc/LDP directory`). For example, if you want to find all the lines in the guide that begin with a number, use the following syntax:

```
# grep ^[0-9] guide.txt
1 Introduction to Linux                                    1
2 Obtaining and Installing Linux                          40
3 Linux Tutorial                                          85
4 System Administration                                  137
...
# egrep ^[0-9] guide.txt
1 Introduction to Linux                                    1
2 Obtaining and Installing Linux                          40
3 Linux Tutorial                                          85
4 System Administration                                  137
...
# fgrep ^[0-9] guide.txt
```

You can see that grep and egrep returned a search (I deleted all the output except the first four lines). Note, however, that fgrep can not handle regular expressions. You must use fixed patterns or strings with the fgrep command, for example:

```
# fgrep friend guide.txt
large extent  by the  window manager.    This friendly  program is in
copy Linux from a friend who may already have the software,  or share
(Unfortunately, the system was being unfriendly.)
```

Now use egrep to try searching for the pattern of the letter (b) in the file:

```
# egrep "\([b]\)" guide.txt
(see Section 1.8 for a list of compatible boards), or (b) there is an
connect to the  network, or  (b) you  have a  ``dynamic'' IP address,
```

You see that exactly two lines in the file match (b). See what happens when you search with grep:

```
# grep "\([b]\)" guide.txt
This is version 2.2.2 of the book, "Linux Installation and Getting
to PostScript printers. This document was generated by a set of tools
from LaTeX source, so there may be a number of formatting problems.
This is not the "official" version of the book! Please see
...
```

Whoa! Not exactly what you wanted, is it? As you can see, grep does not use the same syntax as the egrep command. But you can use a simpler approach:

```
# grep "(b)" guide.txt
(see Section 1.8 for a list of compatible boards), or (b) there is an
connect to the  network, or  (b) you  have a  ``dynamic'' IP address,
```

This pattern works with grep and fgrep. If you try this pattern with egrep, you get the same results as if you tried extended regular expressions with grep (each line with a (b)).

Each grep program accepts nearly the same set of command-line options. One popular option is -n, or line numbering. This is handy because you see which lines in the file contain matches. This example works for each grep program:

```
# egrep -n "friend" guide.txt
1242:large extent by the window manager.  This friendly  program is
1942:copy Linux from a friend who may already have the software, or
5161:(Unfortunately, the system was being unfriendly.)
```

You can see that matches were made on lines 1242, 1942, and 5161. Another feature of these programs is that you don't have to retype your patterns each time you want to search. As a simple example, if you need to repeatedly search files for different words, you can put these into a file for grep to use. First, create a text file and then use the -f option to specify the file, as follows:

```
# cat > mywords
wonderful
Typewriter
War
# grep -nf mywords guide.txt
574:Typewriter Used to represent screen interaction, as in
617:software since the original Space War,  or, more recently, Emacs
1998:Now you must be convinced  of how wonderful Linux  is, and all
2549:inanimate object is a wonderful  way to relieve the occasional
3790:    Warning:  Linux  cannot currently  use 33090  sectors of
7780:to wear the magic hat when it is not needed, despite wonderful
10091:wonderful programs and configurations are available with a bit
```

Because you also use the line-numbering option, you should note that it has to come before the `-f`, or file, option, or `grep` reports an error, complains it can't find file `n`, and quits.

You can make `grep` act like `fgrep` with the `-F` option or like `egrep` with the `-E` option. You can also find a unique version of `grep` on your system, called `zgrep`, which you can use to search compressed files, the topic of the next section.

Compressing and Uncompressing Files

This section introduces you to the basics of archiving and compressing files. However, for details concerning using these programs for the purpose of system management or backing up your system, see Hour 23. Read on, and you'll learn how to build your own archives and save disk space.

Creating Archives with the Tape Archive Command

The `tar` (tape archive) program has its roots in the early days of computing before floppy drives, hard disks, and CD-ROMs. Software was distributed and backed up on large reels of magnetic tape, so one of the first programs to run on computers was a tape reader. Over time, the `tar` program proved its merit as a convenient way to transport files, and many programs for Linux come packaged in `tar` archives (your OpenLinux CD-ROM uses the `rpm` program to package files; see Hour 22).

Using `tar`, you can create an archive file containing multiple directories and files. The version of `tar` installed on your system also supports a `-z` option to use the `gzip` program to compress your archive. (`gzip` is discussed later in this chapter.)

The `tar` command has a bewildering array of options, but it's not hard to use. You can quickly and easily create an archive of any desired directory.

First, create a directory with three files, and then create a subdirectory with another three files:

```
# mkdir mydir
# cd mydir
# touch file1 file2 file3
# mkdir mydir2
# cd mydir2
# touch file21 file22 file23
# cd ../..
# tree mydir
mydir
¦-- file1
¦-- file2
¦-- file3
`-- mydir2
    ¦-- file21
    ¦-- file22
    `-- file23

1 directory, 6 files
```

Now that you have a directory and files, create a `tar` archive using the `c` (create) and `f` (file) options with this command:

```
# tar cf mydir.tar mydir
# ls -l *.tar
-rw-r--r--   1 bball    users       10240 Jan  5 15:01 mydir.tar
```

Notice that your original directory is left untouched. By default, `tar` does not delete the original directories or files. You can use the `--remove-files` option if you want to do this, but it's not recommended. If you want to see what's going on, you can use the `v` option, like this:

```
# tar cvf mydir.tar mydir
mydir/
mydir/file1
mydir/file2
mydir/file3
mydir/mydir2/
mydir/mydir2/file21
mydir/mydir2/file22
mydir/mydir2/file23
```

The `tar` command shows you what directories and files are being added. Does this mean you have to add all the files in your directories? No! You can use the `w`, or interactive option, and have `tar` ask if you want each file added. This can be handy for selectively backing up small directories, for example:

```
# tar cwf mydir.tar mydir
add mydir?y
add mydir/file1?n
add mydir/file2?y
add mydir/file3?n
add mydir/mydir2?y
add mydir/mydir2/file21?y
add mydir/mydir2/file22?n
add mydir/mydir2/file23?y
```

Here I left out `file1`, `file3`, and `file22` from this archive. But how can you make sure? One way is to use two `tar` options, `t` to list an archive's contents and `f` to specify a `tar` archive to use, for example:

```
# tar tf mydir.tar
mydir/
mydir/file2
mydir/mydir2/
mydir/mydir2/file21
mydir/mydir2/file23
```

Note that if options are placed in the wrong order (like the `grep` example), `tar` complains and quits. Now that you know how to create and see the contents of an archive, you can learn how to extract the whole archive or a single file. To extract everything, you can use the `-x`, or extract, option with `-f`. Just so you know what's going on, include the `-v` option, too:

```
# tar xvf mydir.tar
mydir/
mydir/file2
mydir/mydir2/
mydir/mydir2/file21
mydir/mydir2/file23
```

If you want only a few files from your archive, you can again use the `w` option:

```
# tar xvwf mydir.tar
extract mydir/?y
mydir/
extract mydir/file2?y
mydir/file2
extract mydir/mydir2/?y
mydir/mydir2/
extract mydir/mydir2/file21?y
mydir/mydir2/file21
extract mydir/mydir2/file23?y
mydir/mydir2/file23
```

Here, I went through the archive interactively extracting files. If you want a single file from an archive, you can specify the file on the command line. For this example, the original `mydir` is removed, and I'm using an empty directory:

```
# tar xf mydir.tar mydir/mydir2/file23
# tree mydir
mydir
`-- mydir2
    `-- file23

1 directory, 1 file
```

As you can see, only one file is extracted. Be careful, though! The `tar` command doesn't overwrite whole directories, but it does overwrite files with the same name.

Try experimenting with `tar` before you start building archives. Some other features to try are selectively deleting files from an archive or adding a file to an existing archive, which is something the next program, `cpio`, can do, too.

You can use other programs, such as BRU-2000 or the taper script to back up your file system or selected files and directories. OpenLinux can also create file archives automatically through `cron` scheduling. See Hour 23 for information on BRU-2000 and the taper script; see Hour 24 for details on `cron` scheduling.

Creating `cpio` Archives

The `cpio` command copies files in and out of `tar` or `cpio` archives. Because `cpio` is compatible with `tar`, this section doesn't go into all the details of how it works, but it has some features that `tar` does not, such as the following:

- Support for both `cpio` and `tar` archives
- Support for a number of older tape formats
- The capability to read files' names from a pipe (which you'll learn about in the next hour)

Very few, if any, software packages for Linux are distributed in `cpio` format. Chances are you won't run across any `cpio` archives in your search for new software across the Internet. But if you're interested in the details about `cpio`, see its man page. For an example of how to use `cpio` to back up specific files, see Hour 23.

Compressing Files with the `gzip` Command

The `gzip` command compresses files. This program is not only handy for saving disk space by compressing large, less often used files, but could be, in combination with `tar`, the most popular compressed file format for Linux. You'll often find files with the `.tgz` or `.tar.gz` format while searching for new Linux software across the Internet.

You'll also find that much of the documentation under your `/usr/doc/HOWTO` directory was compressed with `gzip`. This can save a lot of space. According the Free Software Foundation folks in `gzip`'s manual page, `gzip` has a 60–70%compression rate for text files.

The `gzip` command is easy to use. To compress a file or tape archive, enter the following:

```
# gzip mydir.tar
```

By default, `gzip` compresses your file, appends a `.gz` extension, and deletes your original file. To uncompress your file, you can use the `gzip` companion program, `gunzip`, or the `gzip -d` (decompress) option. You have to make sure the file has a `.gz` (or `.Z`, `-gz`, `.z`, `-z`, or `_z`) extension, or both `gzip` and `gunzip` complain. If you want to specify your own extension, use the `-S` (suffix) option. For example, to compress a tape archive with the extension `.gzipped`, use `gzip` and its `-S` option, like so:

```
# gzip -S .gzipped mydir.tar
```

The `gzip` command also handles zipped, compressed, or pack compressed files. If you want more information during compression or decompression, you can use `-l`, or list option, to see the compressed or decompressed sizes of files. After compressing the directory `mydir` from the previous example, use the `gzip` to get statistics like this:

```
# gzip -l mydir.tar.gz
compressed  uncompr. ratio uncompressed_name
      239     10240  97.9% mydir.tar
```

Finally, `gzip` also has a helpful option, `-t`, to test the integrity of a compressed file. If the file is okay, `gzip` reports nothing. If you need to see `OK`, use `-tv` when you test a file.

Compressing Files with the `compress` Command

The `compress` command does just that: it compresses files. This is one of the earlier compression utilities for the UNIX world.

Files created with `compress` traditionally have a `.Z` extension. To compress a file, enter the following:

```
# compress file
```

To uncompress a file, use this:

```
# uncompress file.Z
```

As with `gzip`, you must specify a filename with a `.Z` extension, or `compress` will complain.

Interested in other compression utilities for Linux? Look on your system for `zip`, `unzip`, `zipcloak`, `zipnote`, `zipsplit`, `zless`, `zcat`, `znew`, `zmore`, `zcmp`, `pack`, `compact`, `shar`, `unshar`, or `zforce`. You might not find all these installed, but you can find versions at favorite Linux software sites (such as `http://metalab.unc.edu/pub/Linux`) that work with OpenLinux.

Summary

This hour introduced the basic OpenLinux commands needed to create, delete, move, copy, search, save, and compress files and directories. As you learn more about OpenLinux during your sessions, you'll build on your basic knowledge to create more complex and custom commands.

Q&A

Q Are there any other file compression programs for OpenLinux?

A Yes. You might be able to get even better compression with the `bzip2` command. This program uses a different compression algorithm than `gzip` and is included with OpenLinux under the `/bin` directory. You can recognize these archives by the `.bz2` extension.

Q I've seen some files with an extension of `.uu` and wonder if these are compressed files?

A No. A file with a `.uu` extension has been converted from a binary format to plain text by the `uuencode` command. To convert the file back to its original form, use the `uudecode` command like so:

```
uudecode somefile.uu
```

These commands are used by some users to prepare artwork, programs, or other binary format files for transmission by electronic mail or for posting in a Usenet newsgroup message (see Hour 12, "Configuring Internet News," for more information about Usenet news).

Q How can I look at what's inside a binary file? If I try to use the `cat` or `less` commands, I see a lot of garbage.

A Try using the `strings` command. To see how to use `strings` with `less`, see Hour 6, "Using the Shell."

Q How do I get more information about each file inside a tape archive? I know that the `t` option shows the file and directory names.

A Use the `v` option along with `t` on the `tar` command line to view the permissions, owner, group, file size, date, time, and name of each item in a tape archive.

Exercises

1. The `tar` program can perform file compression during archiving operations. Create a compressed tape archive of a test directory using `tar`.
2. There are several other compression programs included with OpenLinux. What are their names? (Hint: Use whatever command you think is "apropos"priate!)
3. How can you find all the compressed files included with your OpenLinux distribution?

HOUR 6

Using the Shell

In this hour you're introduced to the shell. Although the trend in personal computing in the last 10 years has been to move away from the command line to a point-and-click interface, the shell is still very much alive in Linux and is used by many Linux programs.

This hour doesn't go into a detailed history of Linux or UNIX shells or take sides in a debate over which computing interface is easier or better to use. Nor does this hour delve into shell programming—there's not enough room in this hour (or even this book) to do so. This hour does, however, discuss the different shells you can find on your OpenLinux CD-ROM, show you how to use the shell to make your Linux experience more enjoyable, and highlight some of the basics of using the shell and the command line.

What is a Shell?

If you're not using the X Window System, the shell is one of the most important programs you use. The shell provides the interface to Linux so you can run programs. In fact, the shell is just another Linux program.

Although you can set up and run Linux without a shell (see Hour 21, "Basic System Administration," for details), even if you use graphical interface programs, you might find that you need to use the shell's command line.

The shell is a command interpreter that can be used to start, suspend, stop, or even write programs. The shell is an integral part of Linux and is part of the design of Linux and UNIX. If you imagine the Linux kernel as the center of a sphere, the shell is the outer layer surrounding the kernel. When you pass commands from the shell or other programs to Linux, the kernel (usually) responds appropriately.

There are many types of shells, but at least five (not counting the visual shell Midnight Commander, discussed in Hour 5, "Manipulation and Searching Commands") are on your CD-ROM. You can determine which shell you use when you log in to Linux by either looking at the contents of the `/etc/passwd` file or by searching the file for your username. Look at the following example:

```
# fgrep bball /etc/passwd
bball:x:100:100:William H. Ball,,,,:/home/bball:/bin/bash
```

Your shell is listed at the end of your `passwd` file entry (`/bin/bash` in the `fgrep` search example).

What Shells are Available?

This section lists the shells available for OpenLinux, along with some unique features of each to get you started. Each of these shells runs programs, and you might want to explore each to see how it works. This section also highlights some of the differences among the shells and points out important configuration files.

All these shells support changing directories with a built-in `cd`, or change directory, command. Interestingly, the `ash` and `tcsh` shells do not have a built-in `pwd`, or print working directory, command and must instead rely on the `pwd` command found under the `/bin` directory.

You chose a specific shell to use during your OpenLinux sessions when you first installed OpenLinux. If you want to change this default shell, use the `chsh` command, followed by the complete pathname of the shell you want to use. For example, to change your default to `bash`, use `chsh`, along with its `-s` option, like so:

```
# chsh -s /bin/bash
```

These shells, listed in Table 6.1, have many, many features. Read the manual pages for each in detail. Some of the features to look for and explore include the following:

- What are the shell's built-in commands?
- How is job control (or background processes, discussed later this chapter in the section, "Running Programs in the Background") handled?
- Does the shell support command-line editing?
- Does the shell support command-line history?
- What are the important startup or configuration files?
- What environmental variables are important for each shell?
- What command-line prompts can I use?
- What programming constructs are supported?

There are several other shells that are included with OpenLinux: `tclsh`, a simple shell and Tcl interpreter; `wish`, a windowing shell for X11; `scotty`, a Tcl interpreter and shell; and `rsh`, a remote shell for running commands over a network. For details, see the `tclsh`, `wish`, `scotty`, and `rsh` manual pages.

TABLE 6.1 SHELLS INCLUDED IN THE OPENLINUX DISTRIBUTION

Name	*Description*
`ash`	Compact `sh`-compatible shell
`bash`	Bourne Again Shell (`ksh`- and `sh`- compatible)
`csh`	symbolic link to `tcsh`
`ksh`	`pdksh`, public domain Korn (`ksh`- compatible) shell
`sh`	symbolic link to `bash`
`tcsh`	`csh`-compatible shell
`zsh`	Z-shell; a `csh`-, `ksh`-, and `sh`- compatible shell

Features of `ash`

The `ash` shell, by Kenneth Almquist, is one of the smallest shells available for Linux. This shell has 24 different built-in commands and 10 different command-line options. The `ash` shell supports most of the common shell commands, such as `cd`, along with most of the normal command-line operators (discussed later this chapter in the section, "Understanding the Shell Command Line").

This is a popular shell that is generally used when you boot OpenLinux in the single-user mode (typing linux single at the LILO boot prompt) or for rescue mode or diskette versions of Linux. The small executable size, generally one-tenth of the `bash` shell, makes `ash` an ideal shell for small file systems.

Features of the Default Linux Shell—`bash`

The `bash`, or Bourne Again Shell, by Brian Fox and Chet Ramey, is one of the most popular shells for OpenLinux. It features 48 built-in commands and a dozen command-line options. The `bash` shell works just like the `sh` shell and has a symbolic link under the `/bin` directory, called `sh`, that points to the `bash` shell.

Not only does `bash` work like the `sh` shell, but it also has features of the `csh` and `ksh` shells. Because `bash` is so widely used, it is used for the examples in this hour. Later you're shown how to customize your command-line prompt using the `bash` shell.

The `bash` shell has many features. You can scroll through your previous commands with the arrow keys (a history feature), you can edit a command line, and if you forget the name of program, you can even ask the shell for help by using filename completion. You do this by typing part of a command and then pressing the Tab key. For example, if you type **`l`** and press the Tab key, you see the following:

```
# l<TAB>
laser       less        listres     locale      look        lsac
last        lesskey     lkbib       localedef   lookbib     lsattr
lastb       let         lmorph      locate      lpq         lsc
latex       lex         ln          lockfile    lpr         lsl
lbxproxy    lha         lndir       logger      lprm        lynx
ld          lightning   loadkeys    login       lptest      lz
ld86        lisa        loadunimap  logname     ls
ldd         lispmtopgm  local       logout      lsa
```

The `bash` shell responds by listing all known commands beginning with the letter l (or any executable file in the current directory). This can be very handy if you can't remember complex command names.

The `bash` shell also has built-in help and lists all the built-in commands, as well as help on each command. For example:

```
#  help
GNU bash, version 1.14.7(1)
Shell commands that are defined internally. Type `help' to see this list.
Type `help name' to find out more about the function `name'.
Use `info bash' to find out more about the shell in general.
```

```
A star (*) next to a name means that the command is disabled.

 %[DIGITS ¦ WORD] [&]               . filename
 :                                  [ arg... ]
 alias [ name[=value] ... ]         bg [job_spec]
 bind [-lvd] [-m keymap] [-f filena break [n]
 builtin [shell-builtin [arg ...]]  case WORD in [PATTERN [¦ PATTERN].
 cd [dir]                           command [-pVv] [command [arg ...]]
 continue [n]                       declare [-[frxi]] name[=value] ...
...
 while COMMANDS; do COMMANDS; done  { COMMANDS }
```

To get help with a particular command, type the command name after the `help` command. For example, to get help with `help`, type the following:

```
# help help
help: help [pattern ...]
    Display helpful information about builtin commands.  If PATTERN is
    specified, gives detailed help on all commands matching PATTERN,
    otherwise a list of the builtins is printed.
```

NEW TERM The `bash` shell has several important files called *resource*, *run configuration*, and *shell startup* files. These files are used when you first log in to OpenLinux to define or share predefined values or definitions, such as the type of terminal used, default editor and printer, or location of executable programs. The `/etc/profile` initialization file is used systemwide (for all users) to set options, such as environment variables (discussed later) or to send a message (such as "Welcome to OpenLinux!") when you first log in. You can also use a `.bashrc` login file in your home directory for personalizing how your `bash` shell starts or handles different keystrokes (such as Backspace), and a `.profile` resource file (also in your home directory), which is used to tell your shell which resource file to use after you log in to OpenLinux.

For more information about the `bash` shell, there are a manual page, info pages you can browse with the `info` command, and documentation under the `/usr/doc/bash` directory.

The Public Domain Korn Shell—`pdksh`

The `pdksh`, or public domain Korn shell, originally created by Eric Gisin, features 42 built-in commands and 20 command-line options. This shell is found under the `/bin` directory, but a symbolic link also exists under the `/usr/bin` directory.

The `pdksh` shell is named `ksh` in your Linux system and like the `bash` shell, reads the shell initialization script `/etc/profile` if a file called `.profile` does not exist in your home directory. Unfortunately, this shell does not support the same command-line prompts as the `bash` shell. However, this shell does support job control (discussed later this hour), so you can suspend, background, recall, or kill programs from the command line.

This shell is nearly compatible with commercial versions of the Korn shell included with commercial UNIX distributions. Documentation for this shell is in the `ksh` manual page and in the `pdksh` directory (under the `/usr/doc/pdksh` directory).

Features of the `csh`-Compatible Shell—`tcsh`

The `tcsh` shell, by William Joy (and 47 other contributors), features 53 built-in commands and 18 command-line options. This shell emulates the `csh` shell but has many more features, including a command-line editor with spelling correction.

This shell is not only compatible with the `bash` shell prompts; it offers more prompt options than `bash`. `tcsh` uses the file `csh.cshrc` under the `/etc/directory` (much like bash's `/etc/profile`) if the `.tcshrc` or `.cshrc` resource files do not exist in your home directory. Like the `bash` shell, you can scroll through commands you've entered and edit the command line.

Get a list of the `tcsh` commands by using the `builtins` command (`tcsh` does not have help like the `bash` shell), as follows:

```
# builtins
:          @          alias      alloc      bg         bindkey    break
breaksw    builtins   case       cd         chdir      complete   continue
default    dirs       echo       echotc     else       end        endif
endsw      eval       exec       exit       fg         filetest   foreach
glob       goto       hashstat   history    hup        if         jobs
kill       limit      log        login      logout     ls-F       nice
nohup      notify     onintr     popd       printenv   pushd      rehash
repeat     sched      set        setenv     settc      setty      shift
source     stop       suspend    switch     telltc     time       umask
unalias    uncomplete unhash     unlimit    unset      unsetenv   wait
where      which      while
```

For more information about this shell, read the `tcsh` manual page, or look in the `tcsh` directory under the `/usr/doc/tcsh` directory to see a Frequently Asked Questions (FAQ) file and other text files.

`zsh`

The `zsh` shell, originally created by Paul Falstad, is one of the largest shells for Linux and features 84 built-in commands. The `zsh` shell has more than 50 different command-line options and also emulates the `sh` and `ksh` shell commands.

Like the `bash` and `tcsh` shells, the `zsh` shell enables you to scroll through previous commands and complete, edit, or spell-check the command line. It also enables you to use job control to manage running programs. This shell features advanced command-line options for searching or matching file patterns.

Systemwide startup files for this shell are in the `/etc` directory:

```
/etc/zlogin
/etc/zlogout
/etc/zshenv
/etc/zshrc
```

These files are parsed if the `zsh` shell cannot find equivalent files, but with a leading period, such as `.zlogin`, in your home directory. This shell also has more command-line prompt options than other shells, such as `bash` or `tcsh`. This shell has features similar to all other shells and can emulate the `sh` or `ksh` shells when called as a symbolic link (although your OpenLinux system has the `sh` shell linked to the `bash` shell).

There's a lot of information for this shell: 10 manual page files, along with a `/usr/doc/zsh` directory filled with help files, examples, and other up-to-date and useful information.

Understanding the Shell Command Line

When you use the shell to start a program at the command line, the shell interprets your command, and the command echoes its output back to your screen. Using the shell, you can have the program's output sent elsewhere, such as to a file. In fact, nearly everything under OpenLinux is a file; this includes devices such as terminals, printers, and even many programs that can accept input from other files. The shell can also use one program's output as the input for another program or even tell a program to read its input from a file. For example, you can redirect the standard output of the `ls` command to a file:

```
# touch /tmp/trash/file1 /tmp/trash/file2 /tmp/trash/file3
➥/tmp/trash/file4
# ls -w 1 /tmp/trash/* >trashfiles.txt
```

NEW TERM The first command line creates four files in the `/tmp/trash` directory. The second command line creates a text file using the `ls` command's output and containing the names of the files under the `/tmp/trash` directory. The greater than (>) character is called a *standard output redirection operator* and is used to redirect the output of a command somewhere else. You also can use the less than (<) character, or *standard input redirection operator*, to feed information to other programs.

The examples used in the rest of this hour use the `bash` shell. If you want to try some of these command lines, type **`bash`** and press Enter at the command line to use the `bash` shell. When finished, type **`exit`**, press Enter, and you're returned to your original shell.

As a trivial example, you can use the file containing filenames created to build an archive using the `cpio` command. You do this by using the standard input to feed the file names into the `cpio` command:

```
# cpio -o <trashfiles.txt >trash.cpio
1 block
```

This command line causes the `cpio` command to read a list of files from the standard input, the `trashfiles.txt` file, and then creates an archive by sending its output through the standard output to a file called `trash.cpio`.

The `cpio` command is used, like the `tar` and `dump` commands, to archive or back up OpenLinux files. See Hour 23, "Backing Up and Restoring Your System," to learn how to use backup programs.

Generally, most programs you run from the shell command line have the capability to read from the standard input and write to the standard output. Along with the standard input and standard output, there is also a standard error output (which almost always prints to your display). Using the previous example, if the list of files fed into the `cpio` command contains an error, the `cpio` command complains and sends an error message to your screen:

```
# rm -fr /tmp/trash/file3
# cpio -o < trashfiles.txt >trash.cpio
cpio: /tmp/trash/file3: No such file or directory
1 block
```

One of the existing files has been deleted, but the input file, `trashfiles.txt`, which still contains the list of files, is not changed. When you try to use the list as a valid input to build an archive, the `cpio` command complains and sends an error message to your screen (but still builds the archive).

The shell assigns each input and output file a file number. For the standard input, the number is zero (0). For the standard output, the number is one (1), and for the standard error (where programs usually send error messages), the number is two (2). Knowing this, you can run cpio silently and can cause any errors to be sent to a file. Do this by combining the standard output redirection operator and the standard error's file number, as shown in the following example.

```
# cpio -o < trashfiles.txt >trash.cpio 2>cpio.errors
# cat cpio.errors
cpio: /tmp/trash/file3: No such file or directory
1 block
```

As you can see, the cpio command sent its errors, which normally are sent to the standard error output (your display), to a file called cpio.errors.

Normally, each time you redirect output to a file, either the named file is created, or if it exists, the named file is overwritten and its previous contents are irrevocably lost.

You should use file redirection carefully. If you redirect output to an existing file, you lose the original file, which might not be what you want.

If you want to retain the original contents of a file, you can append the output of a program to a file by using the concatenate (>>), or *append*, redirection operator:

```
# cpio -o < trashfiles.txt >trash.cpio 2>>cpio.errors
```

This command line saves the previous contents of the cpio.errors file and appends any new errors to the end of the file. This approach keeps a log of errors when you run the cpio command. This method is used if you enabled system logging for Linux. Take a look (as the root operator) at the contents of the file called messages, found under the /var/log directory.

If you recall the simple cat command text editor example from Hour 4, "Reading and Navigation Commands," you remember that the standard output redirection operator was used with the cat command to read input from the terminal to create a text file:

```
# cat >file.txt
this is a line
this is another line
EOF
# cat file.txt
this is a line
this is another line
```

NEW TERM The end-of-file, or *EOF*, character is used to close the file and is entered by holding down the Ctrl key and pressing the D key. Add a new feature to this simple editor by using the <<, or *here*, redirection operator, which tells the shell that the EOF character is the character that immediately follows the << operator:

```
# cat >file.txt <<.
> This is a line of text.
> This is another line of text.
.
# cat file.txt
This is a line of text.
This is another line of text.
```

Notice that the file is closed after typing a period (.) on a line by itself, which is handier than using a control key combination to close the file. You can use any character or combination of characters to represent EOF.

Now try using the here operator to build a simple, self-contained database file by combining the `egrep` command (discussed in Hour 5, "Manipulation and Searching Commands") and input redirection. First, use a favorite text editor (such as `pico`, included with the `pine` email program) to create a file called `db`. Type a list of addresses, then wrap the list by putting the `egrep` command at the beginning and the end-of-input character string at the end of the file. Create the file like so:

```
# pico db
```

The `pico` editor might easily become your favorite text editor for OpenLinux because it is easy to use, fast, and extremely safe in saving text files. See Hour 14, "Text Processing," for details about this great little editor.

Next, type the `egrep` command, followed by a short list of addresses, and end the file with a string of characters to match the here operator, like this:

```
egrep -i $1 <<zzzz
Debby, 275 Collins Rd., Vestal NY 13850
Cathy, 1001 N. Vermont St., Arlington, VA 22003
Scotty, 2064 N. 16th St., Arlington, VA 22001
Bill, 4000 N. Pennsylvania Ave., Washington, DC 10000
Fred, Slip 417, N. Woodward Ave., Boca Raton, FL 46002
zzzz
```

Save the file by typing Ctrl+X. Finally, use the `chmod` command to make the text file an executable program, like this:

```
# chmod +x db
```

This creates a short address database. Test your database by typing `db`, followed by a name, city, state, or zip code, like this:

```
# db deb
Debby, 275 Collins Ave., Vestal NY 13850
```

The database works by using the `egrep` command to read the file until the end-of-input string `zzzz`. The `-i` command line option tells the `egrep` command not to distinguish between uppercase and lowercase characters. The `$1` string is a shell variable (discussed in the next section) representing the command-line argument to be fed to the `egrep` command.

Input and output redirection with the shell can be used in many different ways. This discussion continues and you're introduced to shell variables and shown some handy tricks for customizing your shell.

Customizing Your Shell

NEW TERM When you use a shell, you're running the shell in an environment that contains *environment variables*. Environment variables are predefined values or pathnames in various resource text files, found under your home directory and the `/etc` directory. For the `bash` shell, the default, systemwide environment variables are defined in the `/etc/profile` file, whereas personal settings can be found in the file `.bashrc` in your home directory.

There are many different environment variables. Use the `printenv` or `set` command to see a list of the variables currently in use:

```
# printenv
...
PATH=/usr/local/bin:/bin:/opt/kde/bin:/usr/bin:.:/usr/X11R6/bin:/home/
➥bball/bin
HOME=/home/bball
SHELL=/bin/bash
...
```

This hour doesn't list all the environment variables you might find defined for your OpenLinux shell, but one of the most important is the `$PATH` variable. This variable tells the shell where to find executable programs. Without `$PATH`, you have to type the complete *path*, or directory hierarchy of a command, to run a program. For example, if you want to run the `ifconfig` command to check the status of your network connections, you might first try to type its name on the command line:

```
# ifconfig
bash: ifconfig: command not found
# whereis ifconfig
ifconfig: /sbin/ifconfig
```

As you can see, this doesn't mean that the `ifconfig` command doesn't exist or isn't installed on your system; it's just that your shell doesn't know where to find the program. To run the `ifconfig` command, you can type the full pathname before the command, but if you need to use this program repeatedly, include its directory in the list of known paths in your shell's `$PATH` environment variable.

Do this at the command line by adding the `/sbin` directory to your `$PATH` variable, using the `bash` shell's `export` command (which saves the new variable definition and makes it available to your shell):

```
# ifconfig
bash: ifconfig: command not found
# PATH=$PATH:/sbin ; export PATH
# ifconfig
lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Bcast:127.255.255.255  Mask:255.0.0.0
          UP BROADCAST LOOPBACK RUNNING  MTU:3584  Metric:1
          RX packets:436 errors:0 dropped:0 overruns:0
          TX packets:436 errors:0 dropped:0 overruns:0
```

As you can see, your shell now knows where to find the `ifconfig` command. But this is temporary and only lasts as long as you're logged in or running a particular terminal. Make this change effective for each time you log in by adding the path to the file `.bash_profile` in your home directory or if you're the root operator and want all users to benefit, to the file `profile` under the `/etc` directory.

Look for the following line in the `.bash_profile` file:

```
PATH=$PATH:$HOME/bin
```

Using a text editor, add the `/sbin` directory:

```
PATH=$PATH:$HOME/bin:/sbin
```

If you're the root operator, add the `/sbin` directory in the following line in the profile file under the `/etc` directory:

```
PATH="/bin:/sbin:/usr/bin"
```

After making these changes, read in the new `$PATH` by using the `bash` shell's source command, like so:

```
# source /etc/profile
```

In the profile file, you also see a line like the following:

```
export PS1="[\u@\h \W]\\$ "
```

Although this line might seem somewhat cryptic, this is the prompt string definition for the `$PS1` environment variable and is printed at the command line of your console or terminal window when you use a shell. You can change this string to define nearly any type of prompt string. The preceding definition is in the following form:

```
[username@host base_working_directory]$
```

The `bash` shell has 15 different prompts (`tcsh` has 18, and `ksh` has 35) you can combine with character strings to customize your prompt. For example, you can have the current date and time in your prompt. If you use the `bash` shell export command, you can test different prompts from the command line:

```
# PS1='Date: \d Time: \t-> ';export PS1
Date: Thu Dec 10 Time: 22:19:01->
```

The time is updated each time you enter a command or press the Enter key. If you want to have the shell's name, along with the current directory in the command line, try the `\s` and `\w` prompt characters:

```
# PS1='\s:\w> '; export PS1
bash:/usr/bin>
```

You also can use different escape characters and terminal sequences to control the attributes of your prompt strings. You can use underlining, boldfacing, blinking, or other modes for your prompt strings:

```
# PS1='[\033[4m\u\033[0m@\033[4m\h\033[0m]:';export PS1
[bball@localhost]:
```

This example uses the proper escape sequences for the xterm X11 terminal (found with the `printenv` command, and by looking at the `$TERMCAP` variable) to change the prompt by underlining the username and hostname in the prompt. You can find these definitions included in the file `termcap` under the `/etc` directory, and in the termcap manual page. For more examples and other prompt strings for specific shells, consult your shell's manual page.

NEW TERM Changing the prompt is only one way to customize how you work in your shell. You also can define command shortcuts, or *aliases*, to tailor how your favorite commands work. You can find at least one or two aliases defined for your system in the `bashrc` file under the `/etc/directory`.

Systemwide alias definitions are entered by the root operator. You can put your own definition in the `.bashrc` file in your home directory, but if you're the root operator, you want to put in at least these three for all your users:

```
alias rm='rm –i'
alias cp='cp –i'
alias mv='mv –i'
```

These three aliases cause delete, copy, and rename (move) operations to be done interactively and provide at least some element of safety when deleting, copying, or moving (renaming) files. Without the `-i`, or interactive option, users might not think before deleting or overwriting files.

You also can define aliases to build new commands or provide variations of familiar commands to avoid typing long command-line options. For example, the `ls` command has many different options, but you can define several variations to make life easier. Some alias definitions you might want to try include the following:

```
# list the current directory using color filenames
alias lsc='ls --color'
# long format listing
alias lsl='ls –l'
# show all files except . and ..
alias lsa='ls –AF'
# show all file except . and .. in color
alias lsac='ls -AF –-color'
```

After you enter these changes into your `.bashrc` file in your home directory, you can use the aliases by again using the `bash` shell's `source` command:

```
# source .bashrc
```

Now you can type `lsc`, `lsl`, `lsa`, or `lsac` without adding the command-line options. Just make sure that you don't redefine an existing command! If you come up with some really useful aliases, make sure they're defined for each of the shells active on your system.

Just because a shell is available on the system does not mean that a user can use a particular shell to log in. As the root operator, you can maintain a list of acceptable shells for your system by editing the file `shells` under the `/etc` directory. As a default, the following shells are listed for OpenLinux:

```
/bin/bash
/bin/sh (a symbolic link to the bash shell)
/bin/ash
/bin/tcsh
/bin/csh (a symbolic link to the tcsh shell)
/bin/ksh
/bin/zsh
```

If you don't want your users to be able to use a particular shell, simply remove it from the list! If you try to change your shell with the `chsh` command to use a particular shell for the next log in, the shell must be listed in the `/etc/shells` file. The `chsh` command complains and quits without making any changes:

```
# chsh -s /bin/zsh
Changing shell for bball.
Password:
chsh: "/bin/zsh" is not listed in /etc/shells.
chsh: use -l option to see list
```

Note that this doesn't restrict a user from running a shell after logging in. The only way to effectively manage who can run a particular shell is to change a shell's ownership or file permissions (see Hour 22, "Handling Files and Your File System," for details).

Running Programs in the Background

NEW TERM Most shells also offer a way to start and then run programs as a *background* process. Starting a command in the background means that the command continues to run in memory while control of the shell's command line is returned to your console. This is a handy way to get work done, especially if you are working on a separate terminal, have limited screen space when working in X11, or have lots of memory. Operations such as sorting large files or searching directories and other file systems are good candidates for execution in the background.

Although Linux offers virtual consoles when not working with X (accessed through the Alt and Function keys) and many X11 window managers offer separate desktops, you'll probably run programs in the background many times while using Linux.

Programs are run in the background from the shell command line by using the `&`, or ampersand, operator at the end of a command. For example, to start another terminal program under X11, you want the program to run in the background so that your current terminal is free for further input:

```
# rxvt &
```

This command starts the `rxvt` terminal, and your command-line prompt returns. The program is assigned a process number you can see using the `ps`, or process status, command as in the following example:

```
# ps
...
  291   1 R    0:03 rxvt
...
```

In this example, to keep the list short, not all the running processes are listed. You can stop the program by using the shell's `kill` command with the program's process number:

```
# kill 291
[1]+  Terminated              rxvt
```

NEW TERM Using the `kill` command is a crude way to control background programs. There is a more refined approach that uses other shell commands. Depending on your current shell, you can put running programs in the background, suspend the program, continue to run the program in the background, kill the program, or bring the program back to the terminal display. This is known as *job control*.

If you're running the `bash` shell, put a running program into the background and suspend its operation by holding down the Ctrl key and pressing the Z key on your keyboard:

```
# pine
... program is running... (ctrl-z)...

Pine suspended. Give the "fg" command to come back.

[1]+  Stopped (signal)        pine
# fg
.... program returns
```

In order to be able to suspend the `pine` mail program, you must enable suspension using the `pine` configuration menu. While running `pine`, press the S key to enter the Setup menu and then the C key to enter the Configuration menu. Then, scroll through the options until you highlight "enable-suspend," and press the X key to enable this feature. Next, press the E key to exit the configuration screen and then the Y key to save the changes. You are now able to suspend the `pine` mailer.

Sending a running program into the background and suspending its operation can be followed by the `fg` command to bring the running program back to your display or by the `bg` command to continue to enable the program to run. This can be handy if you want to start a program, such as a newsreader (discussed in Hour 11, "Configuring Internet Email," and Hour 12, "Configuring Internet News"), and then suspend and continue to run the program during lengthy operations (such as updating an internal list of newsgroups) while you run other programs in the foreground.

Using the `bash` shell, you can start, suspend, and run a number of programs and then selectively bring a background program back to your display by the program's job number:

```
# pine
... program is running (ctrl-z)...

Pine suspended. Give the "fg" command to come back.
```

```
[1]+  Stopped (signal)        pine
# sc
.... program is running (ctrl-z)...

[2]+  Stopped                 sc
# fg %1
... pine program returns...
```

In this example, the `pine` mail reader is started and then suspended in the background to start the `sc` spreadsheet. Because `pine` is the first job suspended, the `bash` shell assigns a job number of `1` to the mail program. The `sc` spreadsheet is then suspended, assigned job number `2`, and returned to the mail program by specifying its job number with the `fg %1` command.

If you run and suspend many jobs in the background, you might not remember a program by its job number or remember which programs are suspended. You can get a list of the suspended programs by using the `bash` shell's jobs command:

```
# jobs
[1]   Stopped (signal)        pine
[2]-  Stopped                 sc
[3]+  Stopped                 emacs-nox
# fg %sc
... sc program is running ...
```

This shows that there are three jobs, the `pine` mailer, the `sc` spreadsheet, and the `emacs` editor, currently suspended in the shell. Note that instead of restarting the `sc` spreadsheet job by referring to its job number, the program is brought back to the foreground by using the `fg %` command with the name of the suspended job.

You also can stop programs using this same approach. Instead of using the `ps` command to find a program's process number and then issuing a `kill` command, you can use `kill` with the `%` operator:

```
# kill %1

[1]-  Stopped (signal)        pine
# kill %emacs-nox

[3]+  Stopped                 emacs-nox
```

Here you see how to use the `kill` command to stop a program by its number or name. This is much easier than using the `ps` command, especially if there are a large number of programs or other processes running in the background.

Although not part of any shell, OpenLinux also includes the `killall` command, which you can use to kill processes by name. To use the previous example, in which the `kill` command was used to stop the `rxvt` terminal emulator, instead of typing `kill`, followed by a process number, you can use:

```
# killall rxvt
```

After you press Enter, the terminal emulator process is stopped, and the window disappears. The `killall` command also has an `-i`, or interactive, option you can use to selectively stop programs, or you can specify a process number to kill.

Using your shell's job control facilities is a powerful way to work efficiently with multiple programs, especially if you use a single display or console. All the shells included on your OpenLinux CD-ROM include job control in one form or another. In the next section, you're shown another powerful way to use your shell to run multiple programs on a single command line.

How to Use Pipes

NEW TERM You've already seen how to redirect the output of a program into a file and how to then redirect the contents of that file into another program. But you can do this all at once without the use of a temporary file by using the ¦, or vertical bar, character, which is called a *pipe*. Using pipes to string commands together on the command line, called pipelining, is a quick and powerful way to enhance the power of individual commands and represents a unique strength of Linux and other versions of UNIX.

You definitely use piped commands as you begin to learn how to use Linux. Not only do pipes save you time, but you can use different combinations of piped commands to tackle computing tasks particular to the way you work and the programs you run. At first, your pipe commands might be simple, but as you gain confidence and understanding, you can construct fairly complex pipelines.

NEW TERM Pipes work well under Linux because many commands are also *filters*, which accept some sort of input, optionally process or modify it in some way, and emit the result as output to standard output or another command. Pipes can be used in nearly any computing task and can be used to quickly find information, generate reports, transform data, or view results. First, look at four simple examples:

```
# ls ¦ lpr
# printenv ¦ fgrep EDITOR
# nroff -man mymanpage.1 ¦ less
# cat document.txt ¦ wc ¦ mail -s "Document.txt Report" bball
```

The first command line pipes a listing of the current directory through the line printer command to print a report. The second example searches through a listing of your current shell environment and prints the value of the default text editor. The third example prints the formatted output of a manual page to your display so you can browse the document to check for errors. The last example pipes a text document through the word count command, `wc`, and then electronically mails a report on the number of characters, words, and lines in the document to the user `bball`.

You can use pipes to confront and solve everyday problems not usually solved by individual programs. This is one of the secrets and power of using the shell with OpenLinux! For example, if you have a lot of documents on your system but can't remember which document contains a certain phrase, you can find this information quickly. Instead of running your word processor and opening each file, you could try typing the following:

```
# find /home -name *.doc ¦ xargs fgrep administration ¦ less
```

This command line uses the `find` command to search the `/home` directory for all files ending in `.doc` and then pipes each file's name into the `xargs` command. The `xargs` command then runs the `fgrep` command to search for the word "administration" in each file and pipes the results through the `less` pager. You also can use pipes to not only find information, but to process data and create new files.

```
# find *.doc ¦ xargs cat ¦ tr ' ' '\n' ¦ sort ¦ uniq ¦ tee dict ¦ less
```

The preceding command line builds a file called `dict` that contains a sorted list of unique words contained in all your word processing files. What do you call this type of file? A dictionary! To be honest, not all the dictionary words might be spelled correctly.

This command works by piping each found file through the `tr` command, which translates each character space into a carriage return to break the stream into one word per line. The stream of lines is sorted, and the `uniq` command removes all occurrences of similar lines except for one. Notice that the `tee` command is also used to save the output of the stream to a file.

The `zsh` shell contains some improvements on input and output redirection, so you might not need the `tee` command if you're using pipes on the `zsh` shell command line. See the `zsh` shell documentation for details.

The `tee` command is used to save the results of a pipe at a particular juncture. This is handy when you want to test your results when building pipes or save results in a complex pipe. Look at the following example:

```
# xwd -out wd.xwd
# xwdtopnm < wd.xwd ¦ ppmtogif ¦ tee wd.gif ¦ giftopnm ¦ tee wd.pnm ¦
➥ pnmtotiff >wd.tif
```

In this example, a window dump graphic is created using the X11 `xwd` command, which captures and saves the contents of an X window or desktop. Then, the `xwdtopnm` command is used to convert this graphic into a portable bitmap graphic. The output of the `xwdtopnm` command is then fed into the `ppmtogif` command. The `tee` command is used to save the output, in GIF format, to a file called `wd.gif`. At the same time, the GIF output is converted back into the portable bitmap format by the `giftopnm` command, and the `tee` command is again used to save the portable bitmap as the file `wd.pnm`. Finally, the `pnmtotiff` command saves the portable bitmap file as a TIFF graphic. That's one command line and four graphic conversions!

Using pipes with Linux is an easy way to get work done. As you continue to work with Linux, you can soon develop your own set of favorite command lines. When you develop your favorites, you can then build your own shell commands, which you'll read about in the next section.

Building Shell Scripts

NEW TERM You don't have to be a programmer to write commands for Linux. After you become familiar with different programs and find yourself typing the same command lines over and over, save these command lines into text files, and turn them into shell *scripts*. In the simplest form, a shell script is simply one or several command lines you frequently use. Look at the following example:

```
# rxvt -geometry 80x11+803+375 -bg white -fg black -e pico &
# rxvt -geometry 80x24+806+2 -bg white -fg black -e pine &
```

These two command lines start the `pico` editor and the `pine` mail program in two X11 `rxvt` terminal windows on the second desktop in an 800×600 pixel display. These certainly aren't command lines you want to type each time you want to run these programs. Although you can manually start the terminal windows after moving to the other desktop, it might take some time to correctly size the windows and then start the programs. Turn these command lines into an executable file by saving them into a file with your text editor, and then use the `chmod` command to make the file executable:

```
# chmod +x d2
```

Now when you want to run these programs, all you have to type is the following, which is certainly a heck of a lot easier:

```
# d2
```

You can make this new command even more flexible by using the shell variables `$1` and `$2`, which represent the first and second command-line arguments to a shell command. Edit the file you created, and change the program names to these variables:

```
rxvt -geometry 80x11+803+375 -bg white -fg black -e $2 &
rxvt -geometry 80x24+806+2 -bg white -fg black -e $1 &
```

Note that the order of the variables isn't important. Now when you run your command, you can supply the program names on the command line as in this example:

```
# d2 pine pico
```

This has the same result, but from now on you're able to run nearly any program you want in the terminal windows.

This discussion of using the shell concludes with a simple shell script you can use to safely delete files. There's nothing special about the `rmv` script in Listing 6.1, but it demonstrates some of the power of shell scripts.

LISTING 6.1 THE rmv SAFE DELETE SHELL SCRIPT

```
#!/bin/bash
# rmv - a safe delete program
# uses a trash directory under your home directory
#
# when run, always create a directory called .trash
mkdir $HOME/.trash 2>/dev/null
cmdlnopts=false
delete=false
empty=false
list=false

# get any command-line options
while getopts "dehl" cmdlnopts; do
  case "$cmdlnopts" in
    d ) /bin/echo "deleting: \c" $2 $3 $4 $5 ; delete=true ;;
    e ) /bin/echo "emptying the trash..." ; empty=true ;;
    h ) /bin/echo "safe file delete v1.0"
        /bin/echo "rmv -d[elete] -e[mpty] -h[elp] -l[ist] file1-4" ;;
    l ) /bin/echo "your .trash directory contains:" ; list=true ;;
  esac
done
```

continues

LISTING 6.1 CONTINUED

```
# d - delete any files found on the command line
if [ $delete = true ]
then
  mv $2 $3 $4 $5 $HOME/.trash
  /bin/echo " rmv finished."
fi

# e - empty the trash?
if [ $empty = true ]
then
  /bin/echo "empty the trash? \c"
  read answer
  case "$answer" in
    y) rm -fr $HOME/.trash/* ;;
    n) /bin/echo "trashcan delete aborted." ;;
  esac
fi

# l - show any files in the .trash directory
if [ $list = true ]
then
  ls -l $HOME/.trash
fi
```

The first line of the script invokes the `bash` shell to run the script. After you type this script using your favorite text editor, make the script executable by using the `chmod` command:

```
# chmod +x rmv
```

This script moves unwanted files to a directory called `.trash` in your home directory. When you're sure you want to delete the files, you can then verify the files and empty the trash. Because this script is supposed to act like a regular command, a short, built-in help command is included.

If you want to try the `rmv` script, make sure you type it correctly or change the line containing `rm -fr $HOME/.trash/* ;;` to `rm -i $HOME/.trash/* ;;`, which is much safer than an unconditional delete. If you don't type this line correctly, you might delete your entire home directory!

The script works by first creating a `.trash` directory in your home directory (found with the `$HOME` environment variable). If the directory exists, any error messages generated by the `mkdir` command are discarded by sending the standard error output to the `/dev/null` device. The `/dev/null` device is a handy place to send all complaints, as all input is discarded! This device (known as the 'ol bit bucket) is also used when you don't care about the output of a program and want to hide the output from the display.. Four internal script variables are then defined: `cmdlnopts`, `delete`, `empty`, and `list`.

The script uses the `bash` shell `getopts` command to look at your command line for any options. If a matching letter is found by the `case` statement, the script commands up until the two semicolons are executed. For example, if you want a reminder of how to use the script, you can use the `-h`, or help, option:

```
# rmv -h
safe file delete v1.0
rmv -d[elete] -e[mpty] -h[elp] -l[ist] file1-4
```

This prints a short help message because the script found the letter `h` on the command line, and then printed the message using the `echo` command. To delete files, you must use the `-d`, or delete, command-line option:

```
# rmv -d berries.jpg bowtie.jpg face.gif
deleting: berries.jpg bowtie.gif face.gif rmv finished.
```

This deletes the three files by moving them to the `.trash` directory in your home directory. The `-d` option is detected on the command line, and the script then prints a message, echoes the file names back to your display, and sets the delete variable to true. Because the delete variable is changed to true, the `mv` command found in the `if ... then` statement is executed.

You can verify that the files have been moved by using the `-l`, or list, option to see the contents of your trash:

```
# rmv -l
your .trash directory contains:
total 36
-rw-r--r--   1 bball    users       11967 Nov  6 14:18 berries.jpg
-rw-r--r--   1 bball    users       14010 Nov  6 14:18 bowtie.gif
-rw-r--r--   1 bball    users        8681 Nov  6 14:18 face.gif
```

As before, because the letter `l` is detected on the command line, the script sets the list variable to true and then executes the `ls` command to list the contents of your `.trash` directory. If you're sure you want to delete these files, you can then use the `-e`, or empty, command-line option:

```
# rmv -e
emptying the trash...
empty the trash? n
```

```
trashcan delete aborted.
# rmv -e
emptying the trash...
empty the trash? y
# rmv -l
your .trash directory contains:
total 0
```

The `rmv` script asks if you're sure you want to empty the trash. If you type an **`n`**, the delete is aborted. If you type a **`y`**, the trash is deleted. Because the letter `e` is found on the command line, the empty variable is set to true and the statements following the `if ... then` test line are run. The script prints a message to your display, and then, using the `read` command, waits for you to enter an answer. The answer is then tested, and if it is yes, the files in the `.trash` directory are deleted.

Using the shell, you can quickly build simple programs to accomplish major tasks. Feel free to improve this program by adding features or improving on how file names are handled at the command line. One such improvement might be to add the capability to handle wildcards or whole directories. Another improvement might be an interactive deletion of files. See the `bash` manual page for more information about other shell commands and operators you can use in your own shell scripts.

Summary

This hour introduced just the basics of using a shell with OpenLinux. Don't be intimidated by the command line! Mastery of the intricacies and idiosyncrasies of using any shell can take lots of practice. Make sure you practice safe computing: define aliases to force potentially harmful commands to act interactively; think twice before using wildcards when deleting files; and never use OpenLinux as the root operator all the time. The more you learn about OpenLinux, the more confidence you'll have in tackling problems and building custom solutions when using the shell.

Q&A

Q Help! I was using the shell, a program ran awry, and all of a sudden the screen is full of garbage characters?

A Try using the `reset` command. Chances are that your shell still understands your keyboard input. Type **`reset`** and press Enter to reset your terminal or console.

Q How can I get more information about `bash`?

A Besides the `bash` manual pages, you can find at least three additional files of information under the `/usr/doc/bash` directory. You can also try searching your favorite bookstore for books about this shell.

Q What's the best shell to use with OpenLinux?

A That's a hard question to answer, as each shell has particular strengths or weaknesses. However, the `bash` shell seems to be the most popular, and it is the default shell for other distributions of Linux. Most OpenLinux users are quite happy with this shell, and many shell scripts developed for Linux work with `bash`.

Exercises

1. Locate the default `.bashrc` settings for new users. Modify this file to include safe aliases of the `rm`, `cp`, and `mv` commands.
2. What file should you edit to add your own personal aliases?
3. Modify the `rmv` script to change the location or name of the trash directory.
4. If you use the `-d` option without any filenames on the command line, the `mv` command, through the `rmv` script, reports an error. How can you fix this?

HOUR 7

Using the X Window System

The X Window System installed on your computer, as you learned in Hour 3, “Configuring the X Window System,” is a port of X11 from the XFree86 Project, Inc. This graphical interface includes about 3,500 files, with nearly 200 programs (clients), more than 500 fonts, and more than 500 graphic image files in nearly 50 megabytes of software. You can find almost everything (but not all files or programs) for X11 under the `/usr/X11R6` directory.

This hour shows you several ways to start X11, discusses some of the different graphical interfaces, or window managers, you can use during your X sessions, and provides exercises for several terminal programs (or shell consoles) installed on your system. You’ll also learn about some basic operations, such as copying and pasting text, adjusting your mouse pointer or cursor shape, and doing screen captures. The last section shows you a sampling of X11 clients you might want to try.

Note that many clients, such as text editors, graphics programs, and even other X11 window managers, are discussed throughout this book.

Starting X

When you first log in to OpenLinux, you see a short message like this:

```
Welcome to your OpenLinux system!
You can start X11 with 'startx' or KDE with 'kde'.
```

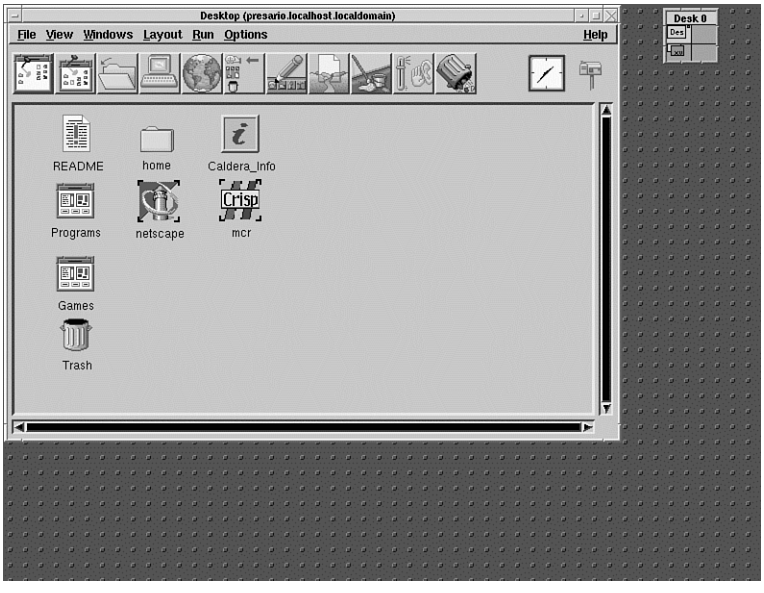
The `startx` and `kde` commands are almost identical shell scripts used to start an X11 session. `startx` is found under the `/usr/X11R6/bin` directory, whereas `kde` is found under the `/opt/kde/bin` directory. To start an X11 session using the `fvwm` window manager (discussed later this chapter in the section "X11 Window Managers") with the Looking Glass desktop client, type **`startx`** on the command line of your console, and then press Enter, like this:

```
# startx
```

If you properly configured X11 to work with your computer's graphics card (as described in Hour 3), your display clears, and after a few seconds, the X11 desktop appears, as shown in Figure 7.1.

FIGURE 7.1

The `fvwm` X11 window manager with the Looking Glass desktop client is one of several ways to use X with OpenLinux.



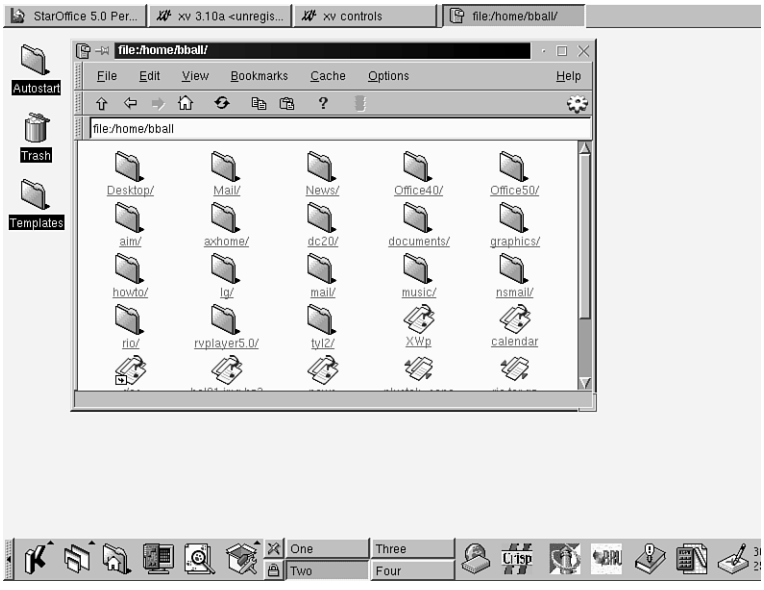
To start an X session using the K Desktop Environment (discussed in Hour 8, "Exploring the K Desktop Environment), type **kde** at the command line, and press Enter, like this:

```
# kde
```

The screen clears, and you soon see KDE's default desktop appear, as shown in Figure 7.2.

FIGURE 7.2

The KDE desktop is a complete X11 environment and includes nearly all the features of a modern graphical interface.



Starting X11 with Different Color Depths

When you start an X11 session with `kde` or `startx`, X11 uses 256 colors, or eight-bit planes (one byte, or eight bits per pixel). To start an X session using 16-bit planes (or two bytes, or 16 bits per pixel), use the `-bpp` option, followed by 16, like this:

```
# startx -- -bpp 16
```

or

```
# kde -- -bpp 16
```

The `-bpp 16` option is passed on to the X server you selected when configuring X as an option to use 64,000 colors. Other color depths, such as 24 or 32, might be possible depending on the capabilities of your graphics card and how you configured your

XF86Config file. Although XF86Config, found under the `/etc` directory, is described in more detail in Hour 3, the pertinent part of this file is in the Screen section. A sample is shown in Listing 7.1.

LISTING 7.1 TYPICAL XF86CONFIG SCREEN SECTION

```
Section "Screen"
    Driver      "svga"
    Device      "NeoMagic"
    Monitor     "Generic Multisync"
    Subsection "Display"
        Depth       8
        Modes       "1024x768" "800x600" "640x480"
#        Virtual  1024 768
    EndSubsection
    Subsection "Display"
        Depth       16
        Modes       "1024x768" "800x600" "640x480"
    EndSubsection
    Subsection "Display"
        Depth       24
        Modes       "800x600" "640x480"
    EndSubsection
EndSection
```

Note the `"Display"` subsections in the listing (for a NeoMagic video graphics display). Each subsection starts with a `Depth` setting, and then lists different `Modes`, or resolutions. The `Depth` setting sets the display depth, or number of colors for the X session. If you always use X with 64,000 colors at a resolution of 800∞600 and don't want to have to type `-- -bpp 16` every time you start X, edit your XF86Config file and simply use a `"Screen"` section, like this:

```
Section "Screen"
    Driver      "svga"
    Device      "NeoMagic"
    Monitor     "Generic Multisync"
    DefaultColorDepth 16
    Subsection "Display"
        Depth       16
        Modes       "800x600"
    EndSubsection
EndSection
```

The `Modes` line tells the X server to use a particular number of dots per inch horizontally and vertically. Your selected X server automatically uses the first available mode value (such as 800∞600) which matches corresponding *mode lines* in your XF86Config file. In Listing 7.1, if all modes are valid, your X session starts with eight bits per pixel and a

display that is 1024 pixels wide and 800 pixels high. To switch to a lower resolution or mode during an X session (such as going from 1024×768 to 800×600), press Ctrl+Alt+KeyPad-. That is, press Ctrl+Alt, and then press the minus (-) key on your keyboard's keypad. To switch to a higher resolution, press Ctrl+Alt+KeyPad+.

The `Virtual` line in Listing 7.1. enables you to have a display larger than the physical area of your screen. This is handy if your computer's graphics card and monitor only support a lower resolution, such as 800×600, but you need to run an X11 client (program) at a higher resolution, such as 1024×768. The `Virtual` line in Listing 7.1 is disabled with a pound (#) sign, but you can enable it by removing the pound sign and then restarting X. Your display is then a scrolling window and moves about the larger, virtual display when your mouse pointer is dragged beyond the edge of the screen.

Unfortunately, some X clients, such as the graphics drawing `xfig` or the arcade action game `xboing`, require larger display areas. Your screen resolution depends on how well your graphics card is supported by a particular X server, how much video memory is installed on your graphics card, the resolution capabilities of your computer's monitor or laptop's screen, and how you have configured your XF86Config file. You cannot, for example, use a 1024×768 display on a laptop that only supports a resolution of 800×600, but you might be able to use a virtual resolution of 1024×768 or greater if enough video memory is installed.

Using Virtual Consoles with X11

NEW TERM Although you can get to a shell command line during an X session when you use a terminal client, such as `rxvt` (discussed later this chapter in the section "Using X11 Terminal Programs"), you can also get to a OpenLinux console when using X on your desktop computer. OpenLinux supports six different *virtual consoles*, or login screens. When you don't use X, you can get to six different login prompts by pressing Alt+F*X*, where *X* is F1 through F6.

For example, when you first log in to OpenLinux, you're at the first virtual console. After you log in, press Alt+F2. You then see another login prompt, and you can log in as another user or start another OpenLinux session. To get back to your first login screen, press Alt+F1.

When you log in to OpenLinux and start an X11 session with `startx` or `kde`, X, by default, uses a seventh virtual screen. Because you started X from the first virtual console, this console is unavailable for use. However, you can get to another virtual console, such as the second, by pressing Ctrl+Alt+F2. You then see the OpenLinux login prompt. To go back to your X session, press Alt+F7. Using this approach, you can go back and forth between your X session and different consoles.

Starting Multiple X11 Sessions

Not only can you use multiple virtual consoles with OpenLinux during an X session, you can also start and use multiple X consoles during an OpenLinux session. This means that you can log in, start X using one window manager at a particular color depth, and then go to a different console, log in, and start another X session using a different window manager and color depth. Then, during your X session, switch between different consoles and X window managers!

Here's a step-by-step example that shows how to log and use the `startx` and `kde` commands at the same time:

1. Start OpenLinux and log in. At the command line, start an X session with KDE using 256 colors with:

   ```
   # kde
   ```

2. Press Enter to start the X session (which uses the seventh virtual screen).
3. After the KDE desktop appears, press Ctrl+Alt+F2. You're at the second virtual console and an OpenLinux login prompt. Log in to OpenLinux again.
4. At the command line, use the `startx` command to start an X session using 64,000 colors with the `fvwm` window manager and the Looking Glass desktop. Include the `:1` and `vt8` command-line options to start a second X11 session named `:1` using the eight virtual screen, like this:

   ```
   # startx -- :1 -bpp 16 vt8
   ```

   The screen clears, and the `fvwm` and Looking Glass desktop appears (like the one shown in Figure 7.1).

The Looking Glass desktop is an X11 client used to provide a graphical workspace during your X11 sessions. The Looking Glass client appears by default when you use `startx` to start an X session. When the desktop appears, click the Caldera or Netscape icon to read the Looking Glass manual. You can find all the information you need to use this client with X.

5. To go to your KDE session, press Ctrl+Alt+F7. To go to another virtual console, press Ctrl+Alt+F3 (because the first and second are being used). To go back to `fvwm`, press Ctrl+Alt+F8.

Logging in to OpenLinux and X11 with `xdm`

NEW TERM The default configuration of OpenLinux is to boot Linux to a login prompt for a console, or shell command line. You can, however, boot OpenLinux directly to an X11 login prompt. This can be done by passing a kernel *message*, or boot-prompt option, through the LILO boot prompt or by configuring OpenLinux to start X11 and the `xdm`, or X display manager client, after booting.

You must properly configure X for your computer's graphics card before trying this, or you can lock up your system!

To boot directly to the `xdm` login screen, turn on your computer, and at the LILO boot prompt, type the following:

```
linux 5
```

After you press Enter, Linux boots and presents the `xdm` login screen, as shown in Figure 7.3. This method works by booting OpenLinux directly to a particular run level, as specified in the OpenLinux system initialization table, `inittab`, under the `/etc` directory. Run level 5 is defined in `/etc/inittab` as follows:

```
x:5:respawn:/usr/bin/X11/xdm -nodaemon
```

This line specifies that when OpenLinux is started, the login prompt is provided by `xdm`. To start your X session (which uses `fvwm` by default), type your username, press Enter, then type in your password, and press Enter again.

To configure OpenLinux to boot directly to this login screen, log in as the root operator, and then open `/etc/inittab` with your favorite text editor. Scroll through the file until you see the following:

```
# Default runlevel.
id:3:initdefault:
```

Editing your system's initialization table is inherently dangerous! Make a backup copy first, and make sure to disable line-wrapping (such as using the `-w` option with the `pico` editor) when editing this file.

FIGURE 7.3

The `xdm` *client is the X display manager and provides a login prompt to X.*

The `initdefault` line tells OpenLinux what run level to use by default. To boot directly to the `xdm` login screen, change the 3 to a 5, like this:

```
id:5:initdefault:
```

Save the file, exit your text editor, and either use the command **`/sbin/telinit 5`** or reboot OpenLinux with the `shutdown` command. When you reboot to OpenLinux, you see the `xdm` screen, as shown in Figure 7.3.

A nice alternative to `xdm` is the K Display Manager, or `kdm`. This client offers more login choices and configurations than the stock `xdm` client. For details about how to configure `kdm`, see the section "Configuring `kdm`" in Hour 8.

X11 Window Managers

NEW TERM One of the great things about X11 is that you have freedom of choice in how you want to manage your windows and programs on your screen. All the hard work of screen management is done by a *window manager*, which is simply another X11 program or client. Of course, you don't have to use a window manager with X. For example, create a file called `.xinitrc` in your home directory with a single line:

```
xterm
```

Then use the `startx` command. This starts X11, but you only have a single terminal window with no window borders, scrollbars, buttons, or colors. The computing life in X is very drab without a window manager!

Although freedom of choice is good, one of the bad things about X11 is the possibly confusing choice and complexity of window managers: you might be initially overwhelmed by the array of configuration files, scripts, or resource settings.

Configuring the `fvwm` Window Manager

The `fvwm` window manager, by Evans and Sutherland Computer Corporation, the Massachusetts Institute of Technology, and Robert Nation, builds on an earlier window manager named `twm`. This window manager is used by default when you start an X session with the `startx` command and provides elements common to many window managers for X:

- Hierarchical root menus (menus and submenus)
- Graphics icons (when minimizing a window)
- 3D window buttons (using shading and color)
- 3D scrollbars (draggable and shaded)
- Customizable display colors and screen elements
- Window manager modules (for icon docks, pagers, and so on)
- Virtual desktops (multiple screens)

NEW TERM Although there is a `fvwm` configuration file, `system.fvwmrc`, in the `/etc/X11/fvwm` directory, the major elements of this window manager are found in the `wm1_modules` directory under the `/usr/X11R6/lib/X11` directory. Configuration and management of `fvwm` (and other window managers) is through a series of macro and configuration files under the `/etc/X11/wmconfig` directory that have been processed by the `wmconfig` (window manager configuration) command. Settings for menus, colors, borders, keyboard values, and other aspects of window management are processed and built from these files when you start an X11 session using `fvwm` (and other window managers). This is a complex system but one that provides a rudimentary form of *session management*, or the capability to save settings for use in the next X11 session. These files are listed in Table 7.1.

TABLE 7.1 X11 MACRO AND CONFIGURATION FILES

Name	*Description*
`AfterStep.M4`	Macros used by the AfterStep window manager
`Common.M4`	Macros and definitions for all window managers
`Fvwm1.M4`	Macros used for the `fvwm` window manager
`WmConfig`	Macros used to reconfigure a window manager's settings following a restart
`desk`	Startup functions for the Looking Glass client
`rc`	Macro definitions about how to process configuration files
`rc.bindings`	Mouse and keyboard settings
`rc.config`	Background and display font settings
`rc.functions`	Specialized mouse and window-handling functions
`rc.goodstuff`	Icon and application-launching definitions
`rc.menus`	Menu definitions
`rc.menus.exclude`	Clients excluded from menus
`rc.modules`	Module definitions for windows and pagers
`rc.options`	Window colors, focus, icons, appearance, placement, decoration, and pager size
`rc.styles`	Window decorations and icon assignments
`xinitrc`	Initial setup and settings for starting an X session
`xsessionrc`	Setup and settings used by `xdm` when starting an X session

For the best overview of how the `wmconfig` command works, read the file `Fvwm-Config-Dokumentation.en.txt` under the `/usr/doc/wmconfig` directory.

Fortunately, you do not (and probably should not) edit these files. The settings and interaction of the macro definitions are quite complex. Unless you know *exactly* what you're doing, leave these files alone.

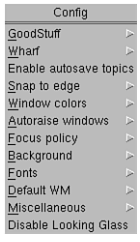
You can change how `fvwm` displays information through the use of numerous configuration menus in the root display. These menus, accessed by pressing Alt+C (or Alt+Shift+C) in a blank area of the desktop, enable you to change many of the following:

- Fonts for windows, icons, and menus
- Window colors (background and foreground)
- Focus policy (clicking in a window to activate it, or moving the cursor over it, and so on)
- Set how windows are handled and appear
- Set the default window manager to use
- Set the location of modules, icons, or desktop buttons
- Set which modules, icons, or desktop buttons appear

To save your settings, you must first select the Enable Autosave Topics item of the desktop menu. Press Alt+C in a blank area of the desktop. A menu appears, as shown in Figure 7.4.

FIGURE 7.4

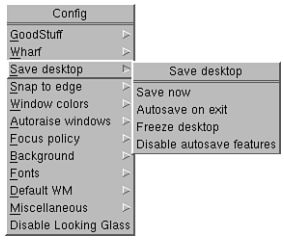
You must first enable configuration saving with the `fvwm` *configuration menu before you can save X session settings.*



Click the Enable Autosave Topics item of the desktop menu. You can then change different settings through the Config menu. When you finish, again press Alt+C. You see that the Config menu has changed and now has a Save Desktop item, as shown in Figure 7.5.

FIGURE 7.5

Save your window manager's settings with the Config menu's save options.

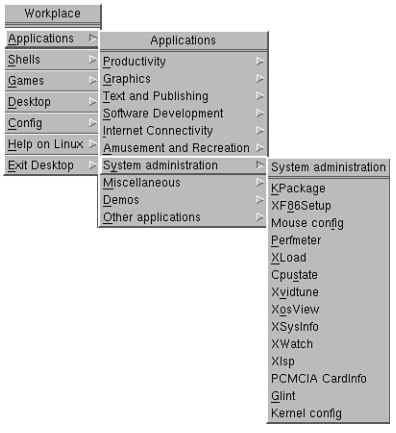


Click the Save Now menu item to save your changes (they are put in the files `desk` and `rc.config` in the `.wmconfig` directory in your home directory.)

You can start different X11 clients from the command line of a terminal window or through `fvwm`'s root menu. To use this menu, move your mouse cursor to a blank area of the desktop, click your left mouse button, and scroll down to a desired group of programs, as shown in Figure 7.6.

FIGURE 7.6

Use `fvwm`'s root menus to launch different X11 clients.



If you accidentally click the Disable Looking Glass menu item in the root Config menu, you can always start Looking Glass by typing **`lg&`** in the command line of a terminal window.

The `fvwm` window manager also supports numerous keyboard commands to control the mouse pointer, menus, and the currently active window. Using these commands, it is possible to control windows or the mouse and select menu items without lifting your fingers from the keyboard. Table 7.2 lists some of the more common commands.

TABLE 7.2 COMMAND `fvwm` WINDOW AND POINTER KEYBOARD COMMANDS

Command	*Description*
Alt+A	Pops up Applications menu
Alt+C	Pops up Config menu
Alt+D	Pops up Desktop menu
Alt+Esc	Displays graphic list of windows

Command	*Description*
Alt+F	Pops up Graphics menu
Alt+G	Pops up Games menu
Alt+H	Pops up Help menu
Alt+I	Pops up Internet Connectivity menu
Alt+P	Pops up Productivity Tools menu
Alt+R	Pops up Amusement menu
Alt+S	Pops up Shells menu
Alt+T	Pops up Terminals menu
Alt+Tab	Activates next window
Alt+V	Pops up Software Development menu
Alt+X	Pops up Text and Publishing menu
Alt+Y	Pops up System administration menu
Ctrl+Alt+down arrow	Moves pointer down 100 pixels
Ctrl+Alt+left arrow	Moves pointer left 100 pixels
Ctrl+Alt+right arrow	Moves pointer right 100 pixels
Ctrl+Alt+up arrow	Moves pointer up 100 pixels
Ctrl+down arrow	Moves active window down to next desktop
Ctrl+left arrow	Moves active window to next left desktop
Ctrl+right arrow	Moves active window to next right desktop
Ctrl+up arrow	Moves active window up to next desktop
Shift+Alt+Tab	Activates previous window
Shift+Ctrl+Alt+down arrow	Moves pointer down 1 percent of screen
Shift+Ctrl+Alt+left arrow	Moves pointer left 1 percent of screen
Shift+Ctrl+Alt+right arrow	Moves pointer right 1 percent of screen
Shift+Ctrl+Alt+up arrow	Moves pointer up 1 percent of screen

If you like the `fvwm` window manager, you might also want to try AfterStep, a sophisticated customization of `fvwm`'s configuration files.

Starting AfterStep

The AfterStep window manager, by Frank Fejes, Alfredo Kenji Kojima, and Dan Weeks, provides window management, controls, and other features similar to the commercial NEXTSTEP operating system (see Figure 7.7). These features include the following:

- 3D, configurable icons
- A "Wharf," or icon dock, for launching X11 clients
- Pop-up, multiple icon menus
- Window shade-type window controls (double-click a window's title bar to draw the shade up or down)
- Sophisticated title bars, buttons, and other decorations
- Styled, pop-up root menus

FIGURE 7.7

The `AfterStep` *window manager provides sophisticated window controls, icons, and an application "Wharf" for your X sessions.*

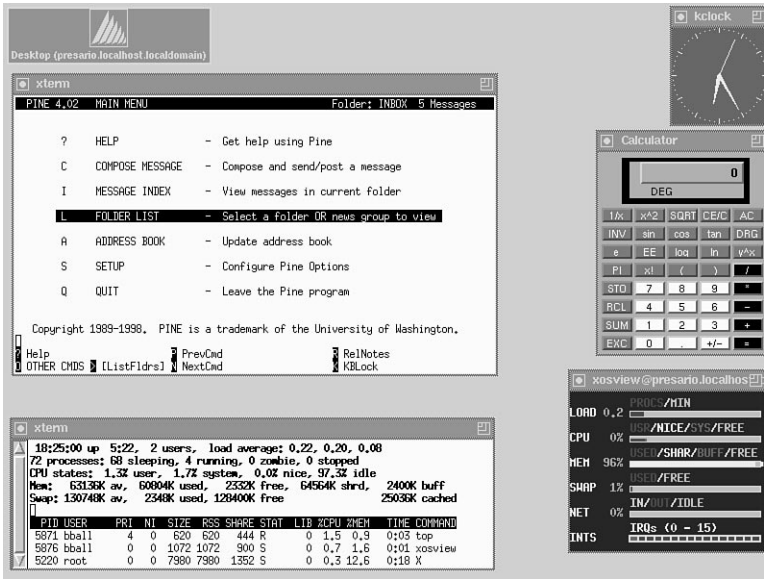
You can use AfterStep as the default window manager through the Default WM menu item in the root display Config menu. AfterStep uses the same menu and desktop configuration scheme as `fvwm`, so you can make changes to your desktop and save the settings for future use (changes are reflected in the `rc.config` file in the `.wmconfig` directory in your home directory).

Starting the `twm` Window Manager

The `twm`, or Tab window manager, found under the `/usr/X11R6/bin` directory, is one of the original window managers for the X Window System. The `twm` client, developed by Tom LaStrange and other authors, provides the most basic window operations, such as window titles, icons, root window menus, and other custom mouse or keyboard commands. Figure 7.8 shows a typical `twm` window management session.

FIGURE 7.8

The twm, or Tab window manager, provides basic X11 desktop displays with program lists, icons, and window controls.


Desktop (presario.localhost.localdomain)
xterm
PINE 4.02 MAIN MENU Folder: INBOX 5 Messages
? HELP - Get help using Pine
C COMPOSE MESSAGE - Compose and send/post a message
I MESSAGE INDEX - View messages in current folder
L FOLDER LIST - Select a folder OR news group to view
A ADDRESS BOOK - Update address book
S SETUP - Configure Pine Options
Q QUIT - Leave the Pine program
Copyright 1989-1998. PINE is a trademark of the University of Washington.
Help PrevCmd RelNotes
OTHER CMDS [ListFldrs] NextCmd KBLock
xterm
18:25:00 up 5:22, 2 users, load average: 0.22, 0.20, 0.08
72 processes: 68 sleeping, 4 running, 0 zombie, 0 stopped
CPU states: 1.3% user, 1.7% system, 0.0% nice, 97.3% idle
Mem: 63136K av, 60804K used, 2332K free, 64564K shrd, 2400K buff
Swap: 130748K av, 2340K used, 128400K free 25036K cached
PID USER PRI NI SIZE RSS SHARE STAT LIB %CPU %MEM TIME COMMAND
5871 bball 4 0 620 620 444 R 0 1.5 0.9 0:03 top
5876 bball 0 0 1072 1072 900 S 0 0.7 1.6 0:01 xosview
5220 root 0 0 7980 7980 1352 S 0 0.3 12.6 0:18 X
kclock
Calculator
DEG
xosview@presario.localhos
LOAD 0.2
CPU 0%
MEM 96%
SWAP 1%
NET 0%
INTS
IRQs (0 - 15)

Start this window manager, like the others, by clicking the Default WM menu item in the root display Config menu. However, `twm` does not use the same menu and desktop configuration scheme as the `fvwm` or `AfterStep` window managers. If you make `twm` the default window manager, you can't go back to using any other manager until you edit the `rc.config` file in the `.wmconfig` directory in your home directory! Open this file with your favorite text editor, and look for the `WINMGR` setting, like this:

```
WINMGR="twm"
```

You can delete this setting or change it to another window manager, like this:

```
WINMGR="afterstep"
```

Save the file, and restart X11 to use the new window manager. The configuration file for the `twm` window manager, `system.twmrc`, is found in the `/etc/X11/twm` directory. If you're the root operator, you can customize this file to support features and programs of your system for all users. If you want to make your own custom `twm` features, copy this file as `.twmrc`, and save it in your home directory.

X11 Terminal Programs

X11 terminal clients provide a console with command-line access to the shell. Although you don't need to use a terminal during your X sessions, it might be a good idea to keep

at least one open (or iconified) so you can start other programs. Having several windows open at one time is also a convenient way to learn new commands because you can have the manual page displayed in one window while you try out the program in another window. You can also use multiple terminal windows to copy and paste information between programs.

This section introduces you to several terminal programs you might want to use with X11: `cmdtool`, `rxvt`, `xterm`, `kvt`, and `kterm`. Table 7.3 lists these various terminals.

TABLE 7.3 X11 TERMINAL CLIENTS INCLUDED WITH OPENLINUX

Name	*Description*
`ansi-xterm`	Symbolic link to `xterm-color`
`cmdtool`	Terminal window emulator included with Sun's OpenWindows
`color-xterm`	Symbolic link to `xterm-color`
`kterm`	Multilingual terminal emulator
`kvt`	Menu-enabled X11 terminal included with KDE
`rxvt`	Memory efficent, color-capable terminal
`xterm`	Standard X11 terminal included with XFree86
`xterm-color`	Shell script to run xterm as a color terminal (using the `xterm-16color` entry in the `/etc/termcap` database)

Changing the `xterm` Terminal Settings

The `xterm` client is a color-capable terminal emulator. When started, it displays an open window with a command line. You can run programs, do word processing, or perform nearly any function you normally do when you aren't running X11. Like most X11 terminal emulators, `xterm` features a resizeable window. Depending on the window manager you use, buttons on the window's title bar enable you to move, size, minimize, or maximize the window and might enable you to close or kill the window and any running programs started from the window. If you minimize an `xterm` window, an icon might appear on the desktop or be placed in an icon dock or taskbar, depending on the window manager.

NEW TERM If you start `xterm` from another terminal, you can choose how and where to initially display the new window through the use of command-line options called *X11 Toolkit options*. These are discussed in the section "Learning X11 Basic Operations" later in this hour. One feature `xterm` shares with the `kvt` terminal emulators is the capability to change fonts on-the-fly.

For example, if you want your terminal to use a larger or smaller font, all you have to do is move the cursor inside the terminal window, hold down the Ctrl key, and press the right mouse button. A menu called VT Fonts with a list of sizes pops up from which you can select larger or smaller sizes.

One really great feature of `xterm`'s VT Fonts menu is the Selection option. Here's how it works: First, run the `xterm` client, and then start the `xfontsel` client from the command line. The `xfontsel` client displays different fonts in many variations, and you can see the effects of different point sizes or orientation on a selected font. After you find an extremely readable font for your display, click the Select button at the top of the `xfontsel` window. Then, move your mouse cursor to the `xterm` window, hold down the Ctrl key, press the right mouse button, and select the VT Fonts menu item Selection. Voilà! Your `xterm` window now uses the font you selected with the `xfontsel` client. This is handy for finding the best typeface to use for your terminal.

Although nearly all terminals support scrolling, not all terminal emulators have nicely drawn scroll bars. You can control whether scrolling is enabled and scroll bars are visible by holding down the Ctrl key and pressing the middle mouse button (for two-button mouse users, make sure you enable three-button emulation and depress both mouse buttons).

If you don't need all these features or need more memory to run programs, you might want to use the `rxvt` terminal emulator, discussed next.

Using the Memory-Efficient `rxvt` Terminal

The `rxvt` client, or terminal emulator, is a color-capable X11 console window with fewer, but possibly more useful, features than the `xterm` client, including the following:

- Smaller size, so this client uses less memory or swap space
- Color-capable terminal emulator
- Supports limited X Toolkit command-line options
- Does not have Tektronix 4014 emulation, which is not really needed for standalone Linux X11 workstations

`rxvt` supports at least one of the same command-line options as `xterm`—the `-e` option to run programs in a standalone X window. The `-e` option is useful if you want to run

programs under X that are normally run from a nongraphical environment (the console), for example:

```
# rxvt -e pico &
```

This command line runs the `pico` editor (part of the `pine` mail program) in a standalone window. You can create, open, edit, and save files, but when you quit the `pico` editor, the window disappears. This is a great way to run interactive console programs under X.

The `rxvt` client also supports a number of X Toolkit options, as you'll see in the next section. By using these options, you can start your `rxvt` terminal at any location of your desktop, with any available font, and with a selection of foreground and background colors.

Learning X11 Basic Operations

A number of basic operations are important for you to know about when using X11 and X11 clients. Many programs accept similar command-line options, so you can customize the size, color, and placement of client windows. This section introduces you to some of the more common command-line options and shows you how to use them.

Not all X11 clients support the same X11 options, known as X Toolkit command-line options. For a full discussion of these options, see the X manual page found under the `/usr/X11/man/man1` directory or an individual client's manual page for details.

Using X11 Client Geometry Settings

You can use the `geometry` option, usually in the form of `-geometry widthxheight+xoffset+yoffset`, to manage how and where your client's window is displayed.

For example, if you want to start an `rxvt` terminal in the upper left corner of your screen, you use the following:

```
# rxvt -geometry 80x25+0+0 &
```

This command starts an 80 character, 25 line `rxvt` terminal, and places its window at the upper left corner of your display. Here's a neat trick: If you are using a virtual-window[nd]capable window manager and have several desktops available, you can start terminal emulators not only in your current desktop, but also in other desktops.

For example, if your current desktop is 800∞600, you can easily start other X11 clients in adjacent desktops by specifying the x and y offsets, as follows:

```
# rxvt -geometry 80x25+801+0
# rxvt -geometry 80x25+0+601
```

The first command line starts another terminal window, but at the upper left corner of the desktop immediately to the right. The second command line starts another terminal window, but at the upper left corner of the desktop immediately below. This is a handy feature to use if you want to set up not only your desktop, but others before you start X11. Using this approach, you can start word processing in one desktop, a Web browser in another, and a graphics program in a third (assuming you have enough memory).

Geometry specifications are useful for building organized, working screens from the command line. Build your desktop, starting clients from the command line or resizing windows, and then use the Save Desktop feature of the root display menu to save your window settings.

Setting Background and Foreground Colors for X11 Clients

You can also usually set the background and foreground colors of a terminal's window with the `-bg` and `-fg` color command-line options. You can find a list of colors supported by the XFree86 X11 servers in the file `rgb.txt` in the `/usr/X11R6/lib/X11` directory. For example, to start the `rxvt` terminal emulator with a red background with yellow text for the foreground, you use the following:

```
# rxvt -bg red -fg yellow
```

If you're not using X11 in the 8-bpp (8-bits per pixel) mode (256 colors) with the `XF86_SVGA` server, you find a more limited selection of colors available. For example, you only have 16 colors available if you use the `XF86_VGA16` server or black and white if you use the monochrome server, `XF86_Mono`. You can also try to see the available colors by using the `xcolorsel` client or `xcmap` client, which displays the colors in a grid and gives the rgb (red, green, and blue) values of the color in base 16, or hexadecimal. (See the X, `xcolorsel`, and `xcmap` manual pages for more information.) Another program to try is the `showrgb` client, which automatically lists the contents of the rgb database, `rgb.txt`.

Other color options include `-bd` for color choices of window borders and the `-rv` and `+rv` reverse video modes, which are useful for monochrome displays.

Setting X11 Client Resources

The X Window System also supports further client configuration through the use of client resources. These are text files that contain settings for different aspects of how a client looks or runs. You might also be able to set different resources of a client program when it first starts by using the `-xrm` command-line option to specify a resource string, but most programs only use a resource file.

In order to change resource settings, you need to know what resources an X11 client uses. You can find this information by either reading the program's manual page or looking for any installed settings in a file with (but not always) the client's name in the `app-defaults` directory under the `/usr/X11R6/lib/X11` directory, as follows:

```
# ls -A /usr/X11R6/lib/X11/app-defaults
Axe                Pixmap.No3d        XLogo              Xconq
Axinfo             Rosegarden         XLogo-color        Xconq-color
Beforelight        Rubik              XMailbox           Xditview
Bitmap             Seyon              XMixer             Xditview-chrtr
Bitmap-color       Seyon-color        XPaint             Xditview.No3d
Bitmap.No3d        Seyon.No3d         XPat               Xedit
Chooser            Skewb              XPat.No3d          Xfd
Chooser.No3d       Triangles          XPlaycd            Xfm
Clock-color        Velvet.ad          XPlaymidi          Xgc
Coolmail           Velvet.ad.No3d     XPostitPlus        Xgc.No3d
Cubes              Viewres            XPostitPlus.No3d   Xgopher
Dino               Viewres.No3d       XRn                Xgopher-color
Editres            XBlast             XScreenSaver       Xloadimage
Editres-color      XCalc              XShowimf           Xmag
Editres.No3d       XCalc-color        XShowimf-color     Xman
Fig                XCalc.No3d         XSm                Xman.No3d
Fig-color          XClipboard         XSok               Xmessage
Freeciv            XClipboard.No3d    XSok.No3d          Xmessage.No3d
GV                 XClock             XSysinfo           Xmh
GXditview          XConsole           XSysinfo-color     Xmh.No3d
Ghostview          XDaliClock         XTar               Xmine
Ghostview.No3d     XDbx               Xterm              Xosview
HMan               XEvil              Xterm-color        Xtartan
Hexagons           XFontSel           XTrojka            Xtetris
KTerm              XFontSel.No3d      XWatch             Xtetris.bw
Knews              XFrisk             Xarchie            Xtetris.c
ML                 XGammon            Xbl                Xvidtune
Mball              XGetfile           XbmBrowser         netscape.cfg
Mlink              XISDNLoad          XbmBrowser-color   xnwdsadmin
Panex              XLoad              Xcolorsel
Pixmap             XLock              Xcolorsel-color
```

You can see that there are quite a few files with application default settings but that not all of the more than 370 programs for X11 installed on an OpenLinux system have settings installed. Each file contains resource strings for a particular X11 client. The resource strings can provide not only information that determines how a program is displayed, but the contents and handling of menus, buttons, or other parts of a program.

You can use X11 resource strings in the file `Xdefaults` in your home directory. Resource and configuration settings for selected KDE clients are stored in the `.kde/share/config` directory in your home directory.

The format of resource strings is defined in the X manual page, but many X11 client manual pages list different resources with examples for a particular client. For example, if you look at the resource settings for the `xpaint` drawing program's main toolbox (contained in the file `XPaint` in the `/usr/X11R6/lib/X11/app-defaults` directory), you see the following values:

```
...
!
!  The top level operation/toolbox menu
!
XPaint.width:                   232
XPaint.height:                  350
...
```

These values tell the `xpaint` client to draw a vertical toolbox. If you want a horizontal toolbox instead, you can resize the toolbox, note the dimensions shown by the window manager during the resize operation, and use the new settings to change the initial size of the toolbox in its default resource settings file, for example:

```
...
!  The top level operation/toolbox menu
!
XPaint.width:                   702
XPaint.height:                  122
...
```

For details about X resources, see the X man page. For details about different client resources, see the program's manual page or other documentation.

Make sure your changes reflect your supported screen size, or programs might start off-screen or with windows too large to be useful. Always use the exclamation character for comments, and if you edit the default, or original application resource file, copy the original settings first to a comment line.

Changing X11 Mouse and Cursor Modes

When you use X11, you might want to change the way your mouse works or switch the order of the mouse buttons. This is especially handy if you're left-handed or if your mouse responds differently from the desired setup. You can also change the type of cursor used by your window manager.

To change your root window cursor, you need to know what cursors are available. You can find a list of cursors in the `cursorfont.h` file under the `/usr/X11R6/include/X11` directory, for example:

```
...
#define XC_exchange 50
#define XC_fleur 52
#define XC_gobbler 54
#define XC_gumby 56
#define XC_hand1 58
#define XC_hand2 60
#define XC_heart 62
#define XC_icon 64
...
```

As you can see, many types of cursors are listed in this file. Knowing these different types of cursors, use the `xsetroot` client, or root window utility program, to set your root cursor image, for example:

```
# xsetroot -cursor_name hand1
```

This changes the root cursor to look like a right-pointing hand. If you are left-handed, you might want to use the left-pointing `hand2` cursor!

An easy way to see all the cursors is to use the `xfd`, or X11 font display, client found under the `/usr/X11R6/bin` directory. Used with the `-fn` command-line option, the `xfd` client displays the entire character set of the cursor font, `cursor`, located in the `/usr/X11R6/lib/X11/fonts/misc` directory.

If you find the left and right mouse buttons inconvenient, change how these buttons are ordered on your mouse by using the `xmodmap` client (which can also change keyboard keys). For example, to reverse the order of your mouse buttons, you can try the following:

```
# xmodmap -e "pointer 3 2 1"
```

This example, from the `xmodmap` manual page, can help left-handed users.

The `xmseconfig` client, which is part of the XF86Config setup program for XFree86, is a graphical mouse configuration utility. However, it does not reorder mouse buttons, and you must run the client as the root operator in order to save any changes.

You can also customize other mouse settings using the `xset`, or user preference, client. For example, if you want to speed up your mouse acceleration, or how fast it travels across the screen, you can try these settings:

```
# xset m "40 4"
```

If this is too fast for you, try the following:

```
# xset m "4 8"
```

Experiment with different settings. You can really slow down your mouse with the `xset m "0 1000"` command line. See the `xset` client manual page for other X11 settings you can change, and see if some of them work with your system.

How to Copy and Paste in X11

Copying and pasting information in X11 involves transferring text between terminal windows or graphics from one X11 client to another. For example, you can use the `xmag` program to select a portion of your desktop and then paste the copied graphic into an open `xpaint` drawing window (see Hour 16, “Graphics Tools”). To do this, first run the `xpaint` client, go to the File menu, and select New Canvas. Then start the `xmag` client. You see a tiny corner cursor. If you click an area of the screen you want to magnify, the `xmag` client displays the selection in a window. You then move your cursor to the `xpaint` drawing window, go to the Edit menu, and select Paste. Your selected graphic is pasted in the `xpaint` window.

Copy and paste operations using KDE are quite different. KDE-aware applications fully support copy and paste operation using Copy and Paste menu items from each client's Edit menu.

If you're running a word processor in one window and the command line in another terminal window, you can copy and paste text between the windows. Both the `xterm` and `rxvt` terminals support copy and paste operations using your mouse cursor and mouse buttons. To copy text, you must first highlight the desired text. If you just want a word, double-click the word with your left mouse button. If you want a line of text, triple-click the line. If you want more than a word or a line, you need to highlight regions of text.

Text regions in terminal windows can be selected in two ways (depending on the capabilities of your X terminal client). Move your cursor to the beginning or end of the text, and then drag up or down with the left mouse button held down to highlight the selected text. You can also click at the beginning of the text with your left mouse button and then, holding down the Shift key, click at the end of the text to highlight a selection.

After you highlight text, there are also two ways to paste the selection in another window. One way is to click in the desired window, hold down the Shift key, and press the Insert key. The other way is to click in the window and then press the middle mouse button (or the left and right mouse buttons simultaneously if you're using a two-button mouse to emulate three buttons).

The `xcutsel` client also copies from one window to another. When you run this client, you see two buttons called Copy PRIMARY to 0 and Copy 0 to PRIMARY. To copy text from one window to another, first highlight text in one window. Then click on the Copy PRIMARY to 0 button. You can then click on the Copy 0 to PRIMARY button, move to the window where you want to paste the text, and use either your keyboard or mouse to paste the text.

Yet another X11 client for copying and pasting text is the `xclipboard` client. This program is especially handy for copying sections of text from messages, FAQs, HOWTOs, or other files. Like the `xcutsel` client, `xclipboard` places the copied text into a buffer but has the added benefit of displaying the text, which you can then save into a file or copy into other windows or programs.

If you want to do more than just copy small bits of graphics or text, you can also capture pictures of whole windows or your desktop. The next section shows you how to capture, save, and display pictures from your X11 desktop.

Capturing and Dumping X11 Windows

You can capture pictures of windows or your entire desktop using several X11 clients included with X11. The first is `xwd`, or the X11 window dump program. You can use this client to take snapshots of your screen or any desired window.

The `xwd` program is easy to use. You want to redirect the output or specify a file on the command line because if you don't, the file is sent to the standard output and scrolls up your terminal window. To redirect the output, use `xwd`, like this:

```
# xwd > mydump.xwd
```

The `xwd` client also has an `-out` option that can be used to direct the output, like this:

```
# xwd -out mydump.xwd
```

After you press Enter, your cursor turns to a crosshair (+). If you click on the root desktop, the `xwd` client dumps, or captures, a picture of your entire screen. If you click in a window, the `xwd` client captures the contents of the window, even if it is hidden or overlapped by another window.

This is handy if you want to capture a series of pictures of a running client, show off high scores of games, or create quick slide shows. The captured file is in an X11 windows dump format, and you can find a number of clients you can use to view the image. One is the `xwud` (X11 window undump) client. To see your screenshot, you can use the following:

```
# xwud -in mydump.xwd
```

You can also create a slideshow of your images with the `xloadimage` client found under the `/usr/X11R6/bin` directory. For example, if you create a series of screen dumps, you can build a looping slideshow of the screenshots with the following:

```
# xloadimage -fit 1.xwd 2.xwd 3.xwd -goto 1.xwd
```

Using this command line, you can repeatedly page through the dump files by pressing the N character on your keyboard, or you can press the Q character on your keyboard to quit. The `xloadimage` client has many features and can also save your screen dump files in different graphics file formats. See the `xloadimage` manual page for more information.

Many other graphic utilities are included on your OpenLinux CD-ROM. See Hour 16 for an overview of paint and drawing programs, graphics conversion utilities, and other image viewers, such as the `xv` client, which not only captures screenshots, but edits, converts, saves, and prints graphics.

Customizing the X11 Root Window and Using Screen savers

If you have a color monitor, you might want to change the default color or pattern of the root, or desktop, window. You can do this quickly and easily with several X11 clients. I'll also show you how to put pictures into your background and how to set up and use screen savers in X11.

Setting the Background Color

You can change the background color of your display with the `xsetroot`, or root window utility, which is found under the `/usr/X11R6/bin` directory. Your choice of color, as I mentioned previously, depends on the number of color depth of your X11 server. If you're using the SVGA server, you have a choice of 256 colors. For example, you can change the color with the following:

```
# xsetroot -solid red
```

Setting the Background Pattern

If a solid color is too hard on your eyes or too plain for your tastes, you can also use one of nearly 90 different bitmap graphics files from the `/usr/include/X11/bitmaps` directory to set a desktop pattern. For example, to get a red basket-weave pattern for your desktop, use the following:

```
# xsetroot -bitmap /usr/include/X11/bitmaps/wide_weave -bg red
```

This command line tells the `xsetroot` client to load the bitmap graphic file `wide_weave` from the X11 bitmap graphics directory and display the pattern with a background color. If you have a monochrome display, you're out of luck with colors. But you can change the pattern and apparent shade of your background display with different bitmap files. Try the `dimple1`, `dimple3`, or `flipped_gray` bitmap files.

Displaying Pictures on the Root Display

Many users like to display a favorite picture in the root window. If you have a favorite photograph you've scanned or a graphic you like, you can display your image on the desktop with the `xsetroot` client, but the image must be in the X11 bitmap format.

You can use a client that's already been discussed—`xloadimage`. See what graphics file formats the `xloadimage` client recognizes with the `-supported` command-line option, for example:

```
# xloadimage -supported
Type Name  Can Dump Description
---------- -------- -----------
```

```
niff        Yes      Native Image File Format (NIFF)
sunraster   No       Sun Rasterfile
gif         No       GIF Image
jpeg        Yes      JFIF-style JPEG Image
fbm         No       FBM Image
cmuraster   No       CMU WM Raster
pbm         Yes      Portable Bit Map (PBM, PGM, PPM)
faces       No       Faces Project
rle         No       Utah RLE Image
xwd         No       X Window Dump
vff         No       Sun Visualization File Format
mcidas      No       McIDAS areafile
vicar       No       VICAR Image
pcx         No       PC Paintbrush Image
gem         No       GEM Bit Image
macpaint    No       MacPaint Image
xpm         No       X Pixmap
xbm         No       X Bitmap
```

The file formats `xloadimage` can use are listed in the left column. If you have a graphic you want to display, you can use the following:

```
# xloadimage -onroot cathy.gif
```

This loads the graphic file, `cathy.gif`, and displays it (depending on its size) in a tiled, or multiple-view, format. If you only want one large version of your graphic in the root display, use the `-fullscreen` command-line option, for example:

```
# xloadimage -onroot -fullscreen cathy.gif
```

This causes the `xsetroot` command to load the graphic and zoom to fit the display. You have to experiment with different sized graphics to get the best effect for your graphics.

The `xv` client can also be used to put images in your root display. If you use KDE, save your favorite image in JPEG format in the `/opt/kde/share/wallpapers` directory. You can then select the image as a default wallpaper for one of your desktops with the KDE Control Center's Desktop Background dialog box.

Screen Saver Settings and Programs

Although displaying a colored pattern or picture on your desktop can be fun, X11 screen savers also offer password control. Even though screen savers aren't needed to protect modern computer monitors from the "burn-in" effect of a continuous display, they are fun, and you can find an interesting variety installed along with X11.

KDE users can use the KDE Control Center's Desktop Screen savers dialog box to control screen saving.

Use the `xset` client, introduced earlier, to manage screen saving under X11. If you want to see the current settings, use the `q` command-line option (note that there is no hyphen used), for example:

```
# xset q
...
Screen Saver:
  prefer blanking:  yes    allow exposures:  yes
  timeout:  0    cycle:  600
...
```

You can turn on screen saving with the `xset` client by using the `s` command-line option, followed by the word `on`. To set the time in seconds, use the `s` option, followed by the number of seconds you want your X11 server to wait to blank the screen, for example:

```
# xset s 10
```

This sets the time out interval to 10 seconds before the X11 screen saver is activated (just to test screen saving). To enable the screen saver, which is built in to your X11 server, use the `s` option with the word `on`, for example:

```
# xset s on
```

After 10 seconds, X displays a blank screen. If you want to see graphics and a background pattern, you can use the `noblank` option for the `xset s` command-line option, for example:

```
# xset s noblank
```

As you can see, a large X is displayed on the screen. To turn off screen saving, use the `s off` command-line option (don't forget to change the screen saving interval to something more reasonable, such as **`600`** for 10 minutes, if you use `xset`). If this isn't your idea of a screen saver, you can try the `xscreensaver` clients.

The `xscreensaver` and `xscreensaver-command` clients, by Jamie Zawinski, are found under the `/usr/X11R6/bin` directory. The `xscreensaver` client has 16 command-line options. Although this hour doesn't cover all the options, the basic way to use this screen saver is to first run the `xscreensaver` client in the background, as follows:

```
# xscreensaver -timeout 5 &
```

This command sets the screen saver to run after five minutes of no keyboard or mouse activity. You can control this client with the `xscreensaver-command` client to turn the `xscreensaver` on or off or to activate it immediately. Although the `xscreensaver` client has a `-lock` option to password-protect your display, you have to recompile the program to enable this feature.

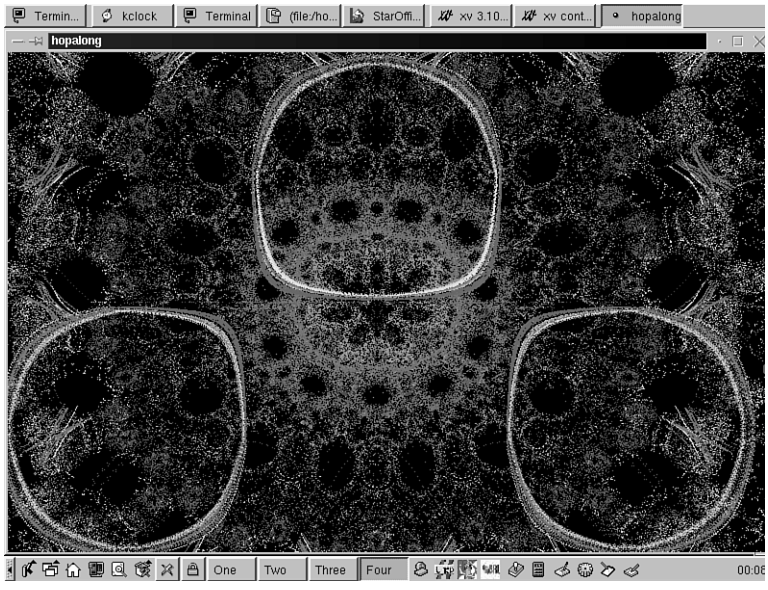
The `xscreensaver` client comes with nearly two dozen different screen savers, which can also be run as standalone programs. For example, you can run the fractal drawing program, `hopalong`, in a window, as follows:

```
# hopalong
```

After you press Enter, a fractal image appears in a window (as shown in Figure 7.9), so you can see what it looks like.

FIGURE 7.9

The `hopalong` *client is part of a screen saver for X11.*



For a list of the screen savers that work with the `xscreensaver` client, read the file `XScreenSaver` in the `/usr/X11R6/lib/X11/app-defaults` directory. You can find other settings in the file, which is the X11 resources file for this client.

You might also be interested in the `xlock` client. Although it is not a screen saver, `xclock` is a sophisticated terminal-locking program with nearly 50 command-line options and more than 50 different displays built in. The `xlock` client is helpful if you want to password-protect your display to prevent others from using your computer while you're away.

By default, after you start the `xlock` program, you must enter your password before you can use your display again. You can use it as a simple screen saver without password protection to display a variety of animations, for example:

```
# xlock -duration 10 -nolock -mode random
```

This command line tells the `xlock` program to display a random selection of its animations, each of which runs for 10 seconds.

The `xlock` client can also make your desktop an animated display if you use the `-inroot` command-line option. This doesn't protect your system, but you might find the visuals stimulating!

Exploring X11 Programs

There's not enough room in this hour to discuss all the X11 clients on your CD-ROM. You can find discussions about different clients throughout the rest of this book, but this section shows you some helpful programs that give you more information about your system and some tips and tricks on how to use them.

Listing X11 Fonts with `xlsfonts`

If you want a list of all the fonts recognized by X11 on your system, you can use the `xlsfonts` client. Use a pager like `less` or `more` (discussed in Hour 4, "Reading and Navigation Commands") if you call the client without any options. You can also use wildcards or patterns to match font names. This can be handy to find a particular font on your system, for example:

```
# xlsfonts -fn *italic*
lucidasans-bolditalic-10
lucidasans-bolditalic-10
lucidasans-bolditalic-12
lucidasans-bolditalic-12
lucidasans-bolditalic-14
lucidasans-bolditalic-14
lucidasans-bolditalic-18
lucidasans-bolditalic-18
lucidasans-bolditalic-24
lucidasans-bolditalic-24
lucidasans-bolditalic-8
lucidasans-bolditalic-8
lucidasans-italic-10
lucidasans-italic-10
lucidasans-italic-12
```

```
lucidasans-italic-12
lucidasans-italic-14
lucidasans-italic-14
lucidasans-italic-18
lucidasans-italic-18
lucidasans-italic-24
lucidasans-italic-24
lucidasans-italic-8
lucidasans-italic-8
```

As you can see, this lists all the italic fonts installed or recognized by your X11 server. You can use the `xlsfonts` client to troubleshoot whether fonts are recognized or installed or to find a font name to choose as an X Toolkit option when starting a client.

Getting Window Information with the `xwininfo` Client

You can use the `xwininfo` client, or window information utility, to get helpful information about a window. When you use this command, you can click another window to get a detailed information listing, for example:

```
# xwininfo
 xwininfo: Please select the window about which you
           would like information by clicking the
           mouse in that window.
```

After you click on the desired window, you see a list of information, such as the following:

```
xwininfo: Window id: 0xc00002 "rxvt"

  Absolute upper-left X:  8
  Absolute upper-left Y:  397
  Relative upper-left X:  0
  Relative upper-left Y:  0
  Width: 574
  Height: 158
  Depth: 8
  Visual Class: PseudoColor
  Border width: 0
  Class: InputOutput
  Colormap: 0x21 (installed)
  Bit Gravity State: ForgetGravity
  Window Gravity State: NorthWestGravity
  Backing Store State: NotUseful
  Save Under State: no
  Map State: IsViewable
  Override Redirect State: no
  Corners:  +8+397  -218+397  -218-45  +8-45
  -geometry 80x11+3-40
```

This information can be helpful, for example, if you want to get the specifications about a window's geometry settings for the next time you run the program or if you want to change the default behavior of a window by editing its resource file.

Making a Sticky Note Calendar with the `xmessage` Client

The `xmessage` client, by Chris Peterson and Stephen Gildea, is a handy way to create quick notes as reminders while you work. This deceptively simple client is easy to use. For example, if you want to make a quick note of a phone number, you can use the following:

```
# xmessage "George called at 10:15; call him back at 555-1212" &
```

This command line displays the `xmessage` client window with the text of your message. Although this is a simple example, you can also use the `xmessage` client to display the output of program searches or use it in your personal schedules to automatically send reminders while you work. See Hour 18, "Personal Productivity Tools," or Hour 24, "Using Scheduling to Automate System Management," for details.

You can also use `xmessage` as a handy calendar display program if you need to keep a copy of the current calendar on the screen or if you want a calendar on your desktop when you start your X session. You can't find a simple X11 version of the `cal` calendar program, but here's one you can use:

```
# cal ¦ xmessage -file "-" &
```

This displays the output of the `cal` calendar program in a square `xmessage` client window.

You can find the `ical` X11 client under the `/usr/X11R6/bin` directory, but this is a personal scheduling utility with a larger calendar display. See Hour 18 for details.

Keeping Time with X11 Clocks

If you're a habitual clock watcher, you're in luck using X11 as you can find several clocks. You're sure to find one you like.

Unfortunately, the `rclock` client, which usually accompanies the `rxvt` terminal, is not included with OpenLinux. This client is much more than just a clock; it's an appointment calendar and mail notification program, as in the following example:

```
# rclock -bg red -fg yellow -update 1 -geometry 80x80+718+0 &
```

This command line puts a square red clock with yellow hands (a second hand is created with the `-update 1` option) in the upper right corner of an 800×600 desktop. A file called `.rclock` in your home directory is used create automatic reminders. The `rclock` client pops up a reminder message at the appointed time and can run programs at certain times (it checks the file every 10 minutes; when email arrives, `rclock` reverses its display). Look for this client on your favorite Linux archive Web site!

The `xclock` client displays time, by default, in a standard clock face, but you can make `xclock` look like a digital clock with the `-digital` option. You can also control the color of the standard clock hands or add a chime for the hour and half hour, for example:

```
# xclock -chime -hd red -hl red -update 2 -geometry 80x80 -bg yellow
```

This command displays an 80×80 pixel chiming `xclock` with a yellow face, red hands, and a sweeping second hand. If you want a digital version, you can use the following:

```
# xclock -chime -update 1 -digital -bg yellow
```

This command displays a digital chiming clock with a yellow background. If you like digital clocks, you might also like the `xdaliclock` client, which uses animation for its digits and has many options to control the digits, coloring, shape, or fonts used in the display, for example:

```
# xdaliclock -24 -cycle -font 9x15 -transparent -geometry +697+3
```

This command displays a transparent digital clock in the upper right corner of an 800×600 display with melting digits that constantly change color. If you click on the digital display, the current day, month, and year are displayed momentarily.

Summary

This hour introduced numerous initial topics relating to the X Window System, such as start up, using different color depths, navigating through virtual consoles, and starting multiple X11 displays. You then discovered several window managers for X11, saw how to configure and manage the X11 desktop, and learned copy and paste operations of text and graphics. Finally, you were introduced to several useful X11 utilties and clients to use to make your X session easier.

Q&A

Q **I still can't get X11 working with my computer's graphics card and monitor! What can I do?**

A If you have a troublesome graphics card (which usually happens with the latest equipment), try using a commercial X11 distribution for OpenLinux from a vendor such as MetroLink, Inc. (`http://www.metrolink.com`) or Xi Graphics, Inc. (`http://www.xig.com`). You can probably get much better support for newer cards.

Q **What is the best window manager to use for X11?**

A This is a religious question, and beyond the scope of this book. One good site to check for different window managers includes `http://www.PLiG.org/~xwinman/` where you can find links to at least 40 different GUIs for X.

Q **How many different window managers for X11 are there?**

A More than you'll ever want installed on your computer! There are more than 100. For example, if you want your desktop to look like an Apple Macintosh, try the `mlvwm` window manager at: `http://www.bioele.nuee.nagoya-u.ac.jp/member/tak/mlvwm.html`

Q **Hey! You haven't mentioned the GNU's Network Object Model Environment! What gives?**

A GNU GNOME development is moving along quite rapidly at the time of this writing. Like KDE, GNOME development is aimed at providing a quality environment and interface support for all versions of Linux. KDE is included with OpenLinux and has had the advantage of building increased popularity and adherents before GNOME's latest releases. You can find out more about GNOME by browsing to `http://www.gnome.org`.

Exercises

1. Create your own information display with the `xmessage` client. What kind of information should be shown?
2. Download and install a different window manager. How is it different? How are windows handled, and what do they look like?
3. See Hour 18 for information about using the `crontab` command. How can this command be used to configure your X11 display to mimic ambient light conditions?

HOUR 8

Exploring the K Desktop Environment

In this hour you'll learn about one of the newest desktop environments for the X Window System. Although there are more than 50 different window managers for X11, each with different themes, desktop colors, and decorations (for example, window controls), the K Desktop Environment, or KDE, reigns supreme in popularity with the OpenLinux crowd. You'll be especially pleased with KDE because Caldera Systems, Inc. has taken special pains to configure KDE's desktop to match programs in the OpenLinux distribution.

The hour will help you learn how to overcome the challenge of configuring KDE, and I think you'll soon agree—KDE is easy to use! Because choosing and using a window manager with X11 is a matter of personal preference, this hour will show you how to configure KDE using the KDE Control Center to change different settings, such as the background of the root display, fonts, the mouse, and the keyboard, and how window *decorations*, such as title bars, scrollbars, and buttons, appear.

KDE features some of the latest and most sophisticated features shared by commercial software libraries such as Motif, and the now fading Common Desktop Environment, or CDE (which is now only offered by one vendor, Xi-Graphics, for Linux). These features include:

- Drag-and-drop actions (such as copy, move, and delete) for files and devices
- Point-and-click dialog configuration of the desktop to display colors, window borders, and themes
- Programs and other data represented as icons on the desktop or in windows with folder icons
- Graphic configuration of your system's keyboard, mouse, and sound
- Single-click convenience to edit files, view graphics, or launch applications
- A desktop trash can for safer file deletions
- Pop-up menus and built-in help for nearly any desktop action and KDE client
- Network Transparent Access, or NTA, so you can click on a graphic document in an FTP listing and have a program on your computer automatically download and display the graphic
- "Sticky Buttons" to put an application or window on every desktop
- JPEG graphic formats for background wallpaper graphics for the root display
- Session management, so open applications and window positions are remembered between sessions (like CDE)
- A suite of personal productivity tools, such as disk and network utilities, crafted to take advantage of the desktop interface and the capability to import and export data to other tools

KDE is more than just an X11 window manager; it is a complete environment and comes with more than 100 clients with a consistent interface. Each client generally has a File and Help menu, so you can easily open files, quit, or get help. Pundits endorse this similarity, whereas some users prefer other X11 window and client management. Fortunately, because you're using OpenLinux, the choice is up to you!

Starting KDE

By default, you'll start KDE after logging into the kdm, or KDE display manager login. However, if you've disabled the login manager, you should know that there's another way to start KDE. When you log in to your OpenLinux console without X11, you're greeted with the following:

```
You can start X11 with 'startx' or KDE with 'kde'.
```

This is true, but if you've configured X11 with the xf86config command, and simply type **kde** and press Enter, your KDE and X session will start using only 256 colors, or an eight-bit pixel depth. To use a greater color depth, start your X sessions using the `-- -bpp`, or bits-per-pixel option. For example, to start KDE with thousands of colors, type **kde**, followed by the `-bpp` option, like so:

```
# kde -- -bpp 16
```

If you're fortunate enough to have a graphics card supporting millions of colors, try

```
# kde -- -bpp 24
```

or

```
# kde -- -bpp 32
```

The available color depths are defined in the `XF86Config` file found under the `/etc` directory. Look for the Depth settings in the Display subsection of the Screen section. If you configured X11 by editing `XF86Config`, use pound sign (#) characters to comment out lower color-depth settings. Another way is to use the DefaultColorDepth option, followed by 8, 15, 16, 24, or 32, in the Screen section. You can then just type **kde** to start X11 at higher color depths. For details about configuring X11, see Hour 3, "Configuring the X Window System and OpenLinux."

When you use `xdm` to log in to Linux and run X11, you might find that you're unable to run programs as the root operator from a terminal window. This is because you must use the `xhost` command to temporarily add the hostname of your computer to the access list of your X server. To do this, you can use this formula: `xhost + localhost; su -c "rootcommand"`, where `rootcommand` is the name of the command you want to run as the root operator (such as the control panel or `printtool`). Afterwards, remove the access with: `xhost - localhost` to preserve your system's security.

Features of the KDE Desktop

As mentioned at the beginning of this hour, KDE has many of the features expected of a modern graphical computer interface. KDE builds on these features to provide an easy to use way of handling files to enable you to be more productive during X sessions. This section highlights some of the ways you can get work done when using the KDE desktop.

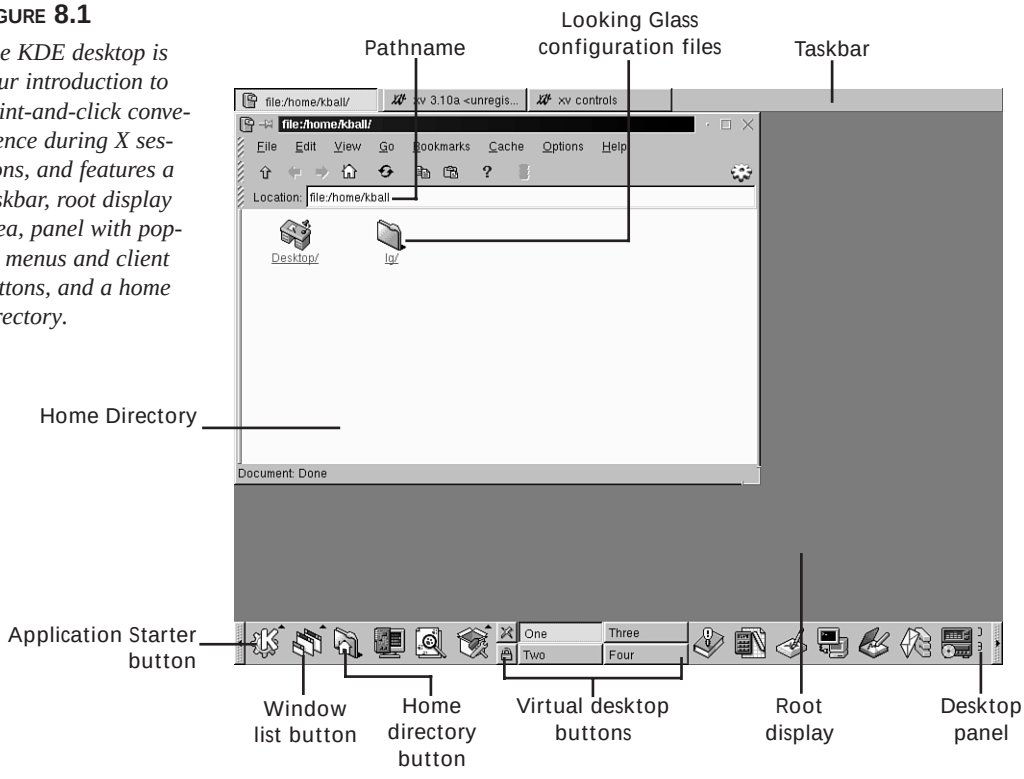
Performing Basic Desktop Actions

When you first start KDE, you see the `kfm`, or K file manager window, and a root display, or desktop, as shown in Figure 8.1.

The KDE desktop consists of several elements: a *taskbar* across the top of display, the root background (or *root display*), and the *desktop panel* along the bottom of your screen. In the panel, starting from the left, is the *Application Starter* button (the large 'K'), followed by several icons representing different applications, folders, and directories. There are four buttons representing the default four *virtual desktops*, or displays, followed by more application icons. (You may see ones for the CriSPlite editor, Netscape, BRU-2000, KDE help, and the Kcalc calculator.)

FIGURE 8.1

The KDE desktop is your introduction to point-and-click convenience during X sessions, and features a taskbar, root display area, panel with pop-up menus and client buttons, and a home directory.



Using Desktop panel

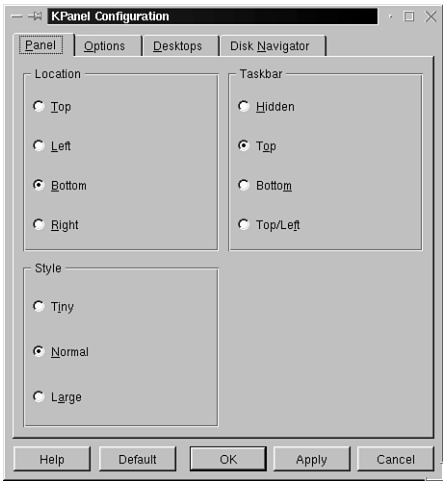
The panel is used as a convenient tool for holding the Application Starter menu (accessed when you click the Application Starter menu), other application icons, the screen lock or logout button, virtual desktop buttons, and other program icons. To change the panel's size or orientation, click the Application Starter button, select Panel then click Configure.

A dialog box appears, as shown in Figure 8.2, from which you can select different settings. When you're finished, click Apply, then the Cancel button.

If you want to change how icons are placed or arranged on the panel, right-click a desired icon, and then select Remove (to delete the item) or Move from the small pop-up menu. If you click Move, you can drag the icon across the panel to a different place. If the panel is getting in the way during your KDE session, click the small button to the far left of the panel to temporarily hide the panel from your screen. To restore the panel, click the small button again, and the panel reappears.

FIGURE 8.2

The Panel Configuration dialog box enables you to change how the panel and taskbar look and where they are placed on your desktop.



Editing the KDE Panel Menu

To edit the desktop's panel menus, click the Application Starter button, select Panel, and then click Edit Menus. The KDE Menu Editor dialog box appears as shown in Figure 8.3. If you're logged in as the root operator, you can change and edit menu items on the panel menus by using drag-and-drop to shift items in the menu list or create items using the Empty menu item.

If you're logged in as a regular user, you can only change menu items for which you have permission. If you right-click on a KDE panel item, you see the message "! PROTECTED Button !". You can, however, edit a single applink menu item in your desktop's panel. To this menu, you can add nearly any other command or client.

For example, to create a new menu item, right-click the Empty menu item, and then select New. A new Empty menu item appears. Right-click the new Empty menu item, then click Change, and the kmenuedit editor dialog box appears, as shown in Figure 8.4. Fill in the required fields, and select a large icon and menu icon for the menu item. When you finish, click Ok to save the changes. You can now drag and drop the new item anywhere in the panel menu's hierarchy.

FIGURE 8.3

The panel menu editor enables you to add or remove menu items from the panel's menus.

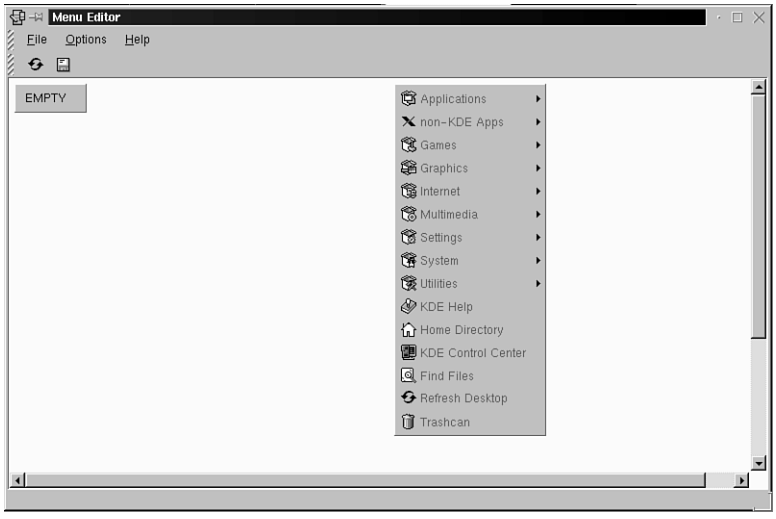
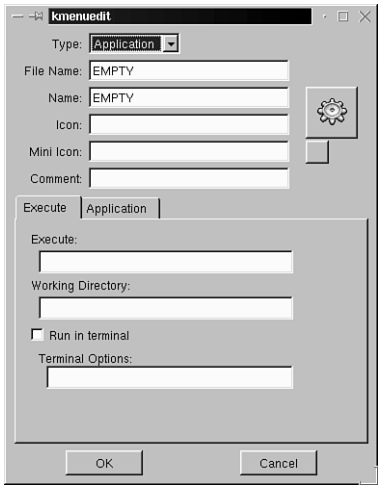


FIGURE 8.4

The kmenuedit dialog box is used to create or edit new individual menu items in your panel's menus.



Using the `kfm` File Manager

The K file manager, or `kfm`, is near the center of the magic of KDE. This file manager, unlike Looking Glass (discussed in Hour 7, "Using the X Window System"), provides a usable desktop where you can drag, drop, multiple-select, copy, move, or delete icons of data files or programs. Many of the desktop actions supported by `kfm` become apparent when you drag or right-click a file's icon.

The `kfm` desktop, which includes your home directory and your root display (as shown in Figure 8.1), is represented by the directory named Desktop in your home directory. If you drag files to this folder, the files' icons appear on your root display. Similarly, if you drag a file from another folder or directory to the desktop, it appears in your Desktop directory.

Configuring KDE with the KDE Control Center

The KDE Control Center is the main dialog box through which you can change numerous settings of your desktop, get system information (such as the currently mounted devices and capacities), or (if logged in as the root operator) configure and control KDE's appearance, background, fonts, and sessions for all users.

Click the Application Starter button on your desktop's panel, and then click KDE Control Center to display the Control Center dialog box. The main dialog box appears, as shown in Figure 8.5.

FIGURE 8.5

The KDE Control Center dialog box provides access to many different controls of your system's KDE sessions.

Using Display Manager Options

Click Applications and then Login Manager in the drop-down menu in the Control Center to change settings for the KDE Display Manager. You must be logged in as the root operator to access this portion of the Control Center. The Login Manager dialog box, shown in Figure 8.6, enables you to change how the `kdm` dialog box appears when you boot OpenLinux.

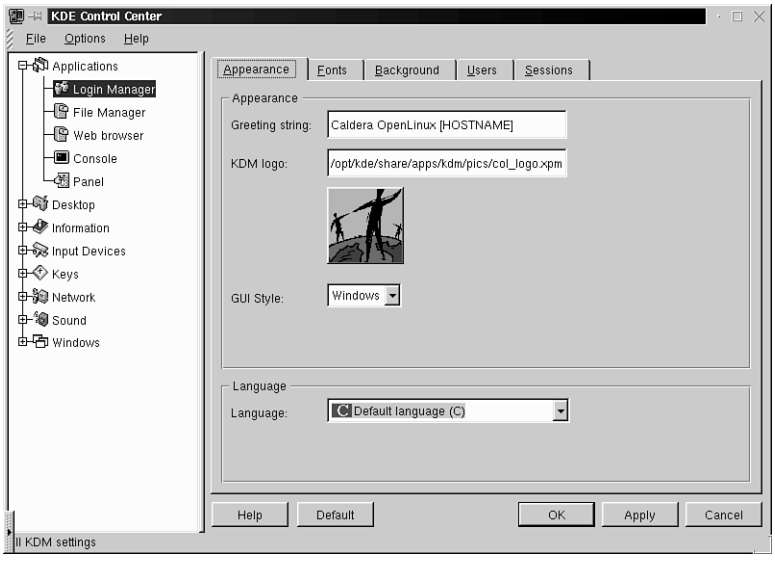


FIGURE 8.6

Use the Login Manager dialog box to change `kdm`*'s login screen and other settings, such as the type and number of X window managers or users allowed to log in.*

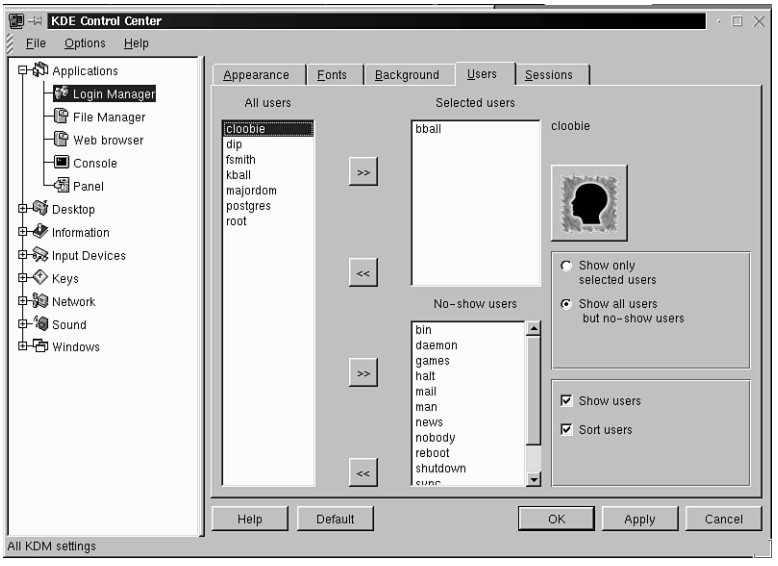
By clicking on different tabs at the top of the dialog, you can change many different features of your kdm login screen:

- Appearance — the greeting strings, logo used in the login dialog, window style, and language
- Background — the wallpaper, background color, and tiling of images for the wallpaper
- Fonts — the greeting font
- Sessions — the type of shutdowns allowed, the commands used to shutdown or restart OpenLinux from kdm, and the types of "sessions" or window managers used for the X session after logging in
- Users — which system users are allowed to log in, whether the user list is sorted, and the icon used for each user (which may be substituted by a scanned photo!)

For example, to control which users are permitted to log in to OpenLinux directly to X, click the Users tab in the Login Manager dialog box. The Users dialog box appears, as shown in Figure 8.7. To selectively control user log-ins, click the Show only selected users button, and then click and add users to the Selected users section of the dialog using the >> button.

FIGURE 8.7

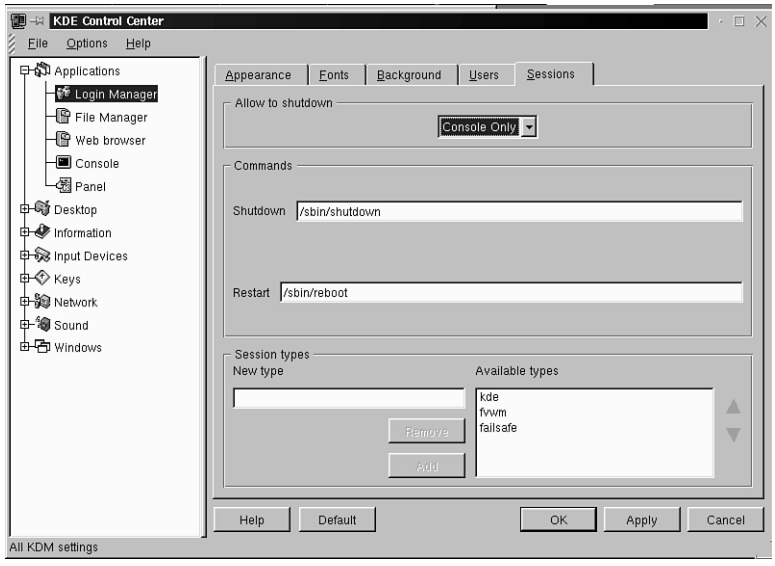
The Users dialog box can control who is permitted to log in to OpenLinux using X and KDE.



To control whether anyone can reboot or shutdown OpenLinux from the `kdm` login screen, when your system shuts down or reboots, and what window managers can be used after logging in, click the Sessions tab of the Login Manager dialog box. Click the Allow to shutdown drop-down menu shown in Figure 8.8, and select who is enabled to stop or restart OpenLinux. When finished, click the Apply button.

FIGURE 8.8

The Sessions dialog box can control who can shut down or restart OpenLinux and what X window managers can be used.



Changing Your Desktop's Wallpaper

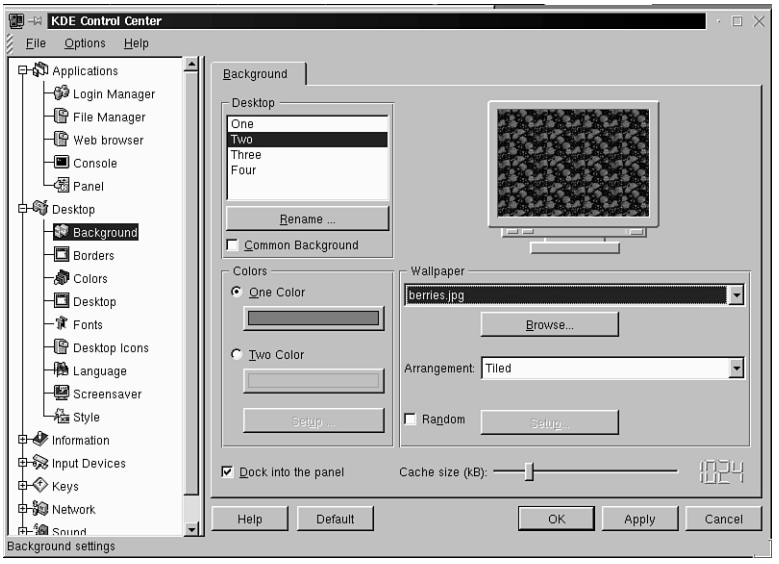
KDE comes with nearly 150 different wallpapers you can use to fill the root display, or background of your desktop. To configure the current desktop's wallpaper, click the drop-down Desktop menu, and then click Background. You can also click the Application Starter button on the desktop panel, and select Settings, then Desktop, and then Screensaver.

The Background dialog box, shown in Figure 8.9, enables you to set the name of each desktop, each desktop's colors, and whether the desktop uses a wallpaper. To set a different wallpaper, click the Wallpaper pop-up menu in the Wallpaper section of the dialog box, and then click Apply.

KDE wallpapers are graphics files in JPEG format. To add to the choice of wallpapers or to use your own wallpapers, log in as the root operator, and copy your favorite graphics (in JPEG format) to the `/opt/kde/share/wallpapers` directory. You can also select wallpaper graphics from any OpenLinux directory by clicking on the Browse button in the Background dialog box.

FIGURE 8.9

Use the Background dialog box to set your desktop's name, colors, and wallpaper.



Changing Your Screensaver

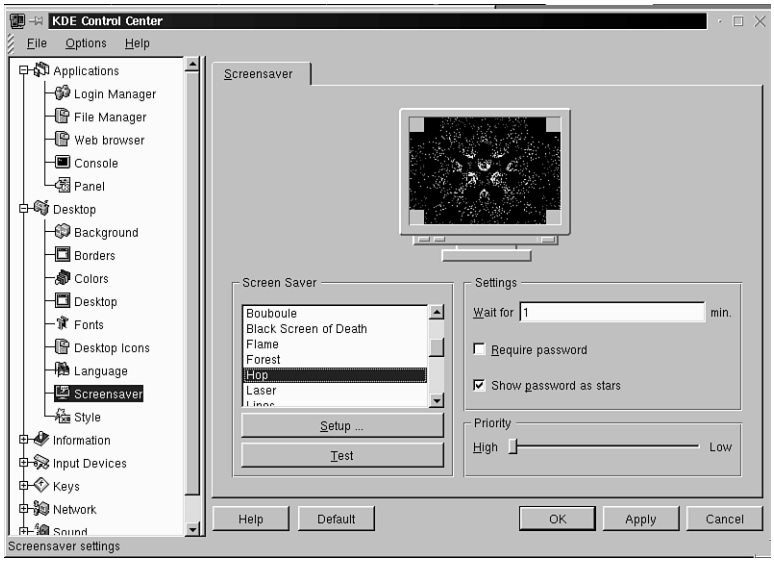
KDE comes with 24 different screensaver settings. To configure the screensaver of your KDE desktop, click Screensaver from the Desktop drop-down menu in the KDE Control Center. You can also click the Application Starter button on the desktop panel, and then select Settings, then Desktop, and then Screensaver.

The Screensaver dialog box, shown in Figure 8.10, has a number of settings, such as the type of screensaver, the time delay before activating the screensaver, and whether you want to require a password to go back to work. After you make your changes, click the Apply button, and then click OK to close the dialog box.

Right-click different corners of the sample display in the Screensaver dialog box to set automatic screen-saving or screen-locking! A small pop-up menu appears, and you can select Save Screen or Lock Screen for each corner. For example, if you set the lower-left corner of the sample display to start screen saving, the next time you move your mouse pointer into the left corner of the display (and leave it there for a second), screen saving starts.

FIGURE 8.10

The Screensaver dialog box has different settings you can use to test a screensaver, set a time delay, or require a password.



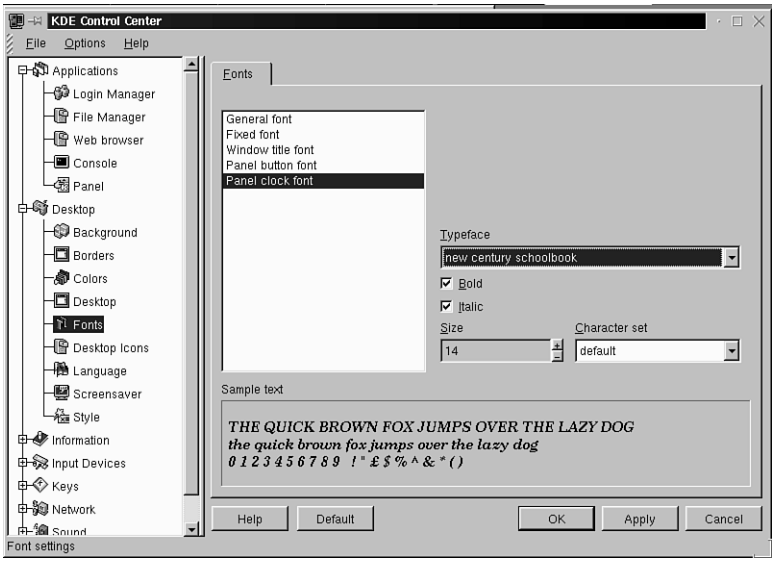
Changing Default Fonts

KDE can also use different fonts for menus, buttons, the panel, or your panel's clock. To set the fonts of your KDE desktop, click the Application Starter button on the desktop panel, and select Settings, then Desktop, and then Fonts. You can also click KDE Control Center from the Application Starter menu, then click Desktop, and then click Fonts.

The Fonts dialog box, shown in Figure 8.11, shows a list of the different desktop fonts, along with a pop-up menu of typefaces. First, click a type of display item, such as the Panel clock font, and then select a typeface, type style (such as bold or italic), and a size. The sample text area of the dialog box changes. To effect your changes, click the Apply button, and then click OK to close the dialog box.

FIGURE 8.11

The KDE fonts dialog box enables you to change the fonts used for menus, buttons, or the desktop panel's clock.



Installing System Sounds

Click the Sound drop-down menu in the KDE Control Center, and then click System Sounds to configure KDE to use sound during your X sessions. KDE recognizes 28 separate system events to which you can assign a sound. Table 8.1 shows a list of currently supported events, such as opening or closing windows. To have KDE play a sound when it first starts, in the Sound dialog box, as shown in Figure 8.12, first click enable systems sounds, and then click the Startup system event. Next, drag the icon of a sound file into the blank Sounds: area of the dialog, and click the Apply button. The next time you start KDE, you hear the sound file play.

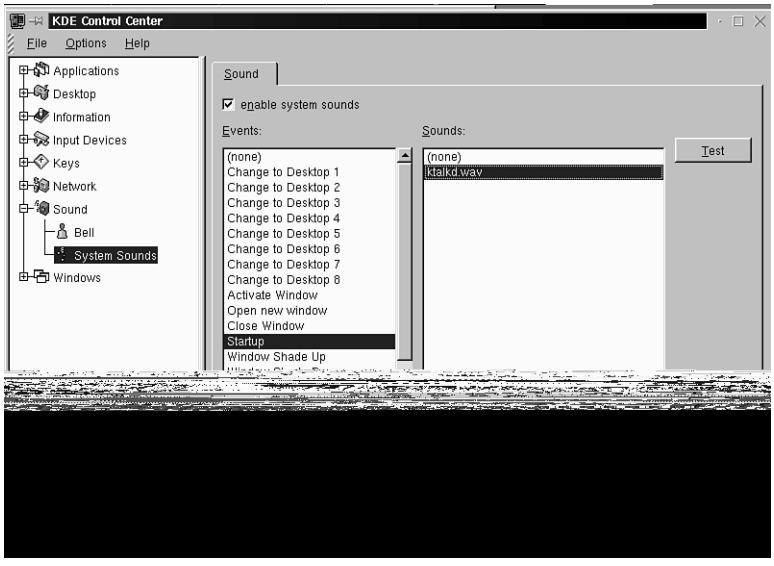
TABLE 8.1 K DESKTOP ENVIRONMENT SYSTEM SOUND EVENTS

Desktop Element	*Events*
Desktop	Changing to 1-8
System	Startup, Logout, Logout Message
Window	Activate, Open new, Close, Shade Up, Shade Down, Iconify, DeIconify, Maximize, UnMaximize, Sticky, UnSticky, Trans New, Trans Delete, Move Start, Move End, Resize Start, Resize End

KDE sounds must be in WAV format. If you've installed StarOffice 5.0, a full directory of various sounds is located under the `Office50/gallery/Sounds` directory. Navigate to the Sounds directory through your home directory, then drag the file `Applause.wav` into the Sound dialog box, click the Startup event, and then click Apply. The next time you start KDE, you'll hear applause!

FIGURE 8.12

The Sound dialog box is used to assign sounds to KDE system events.



Changing Keyboard and Mouse Settings

Click Keyboard from the Input Devices drop-down menu in the KDE Control Center to toggle keyboard character repeat (repeated printing of a character when a key is held down), and whether each key-press generates a key-click sound. Click the Apply button, as shown in Figure 8.13, when you finish with your selection.

Controlling Cursor Movement Through Desktops

The Borders dialog box, which you can also access through the Settings and Desktop menu items from the Application Starter menu of your panel, is indispensable when controlling cursor movement between virtual desktops. By default, you have to click a virtual desktop button on your desktop's panel to move between desktops. But if you click the Enable active desktop borders item, and then click the Apply button, you move to a different desktop by moving your mouse cursor to the edge of the current desktop.

Don't want to click the panel's desktop buttons or drag your mouse to move between desktops? Use the keyboard instead! Press Ctrl+Tab to walk through the desktops. Press Alt+Tab to walk through (activate) windows in the current desktop.

In the Borders dialog box, shown in Figure 8.18, drag the different sliders to set the time delay for desktop switching and the width of the sensitive edge of each desktop.

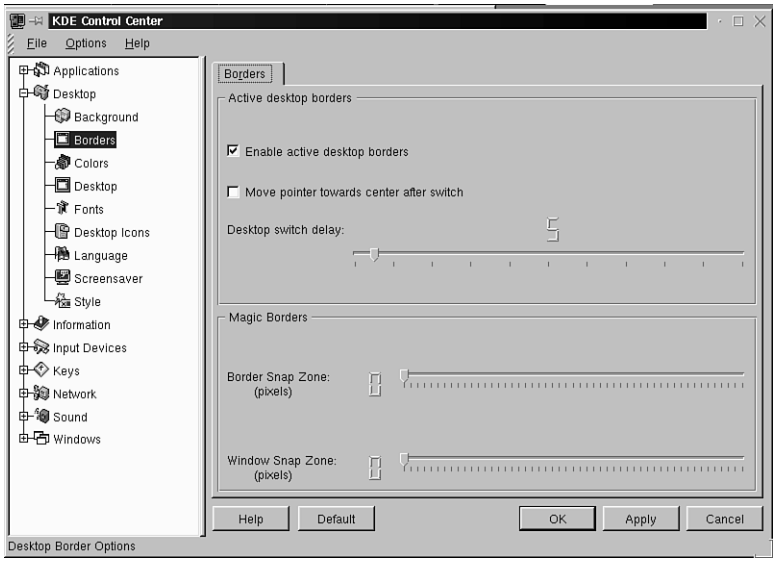


FIGURE 8.18

The Borders dialog box is used to tell KDE whether to use the mouse to move between desktops, how fast to make the switch, and when to make the change.

Summary

This hour introduced you to the basics of configuring the K Desktop Environment. There are many features and different programs specifically tailored to work with KDE, and more appear every day.

Q&A

Q Where is KDE installed?

A The major portion of KDE is installed under the `/opt/kde` directory in your OpenLinux file system. The various KDE clients are found under the `/opt/kde/bin` directory. Each user also has a `.kde` directory installed in the home directory, which is used to store personal settings and configurations.

Q How can I find out more about KDE?

A Click the KDE Help item on your panel's Application Starter menu. KDE's documentation is written in HTML and is displayed by the `kdehelp` client. The documentation files are found under the `/opt/kde/share/doc/HTML` directory in German, English, Spanish, Finnish, Italian, and Norwegian. The language used for all help files is determined by a symbolic file named `default`, which points to a designated language directory. Other languages can be used by changing the Locale setting in the Language item under the Desktop settings in the KDE Control Center.

Q Where can I find more KDE applications?

A Browse to `http://www.kde.org` for a list of the latest programs and application suites for KDE. A full office suite of productivity programs called K Office (which includes a word processor and spreadsheet) is currently under development.

Exercises

1. Create a new application link for a program, such as WordPerfect, Applixware, or StarOffice, and then install the icon into your desktop's panel. (Hint: read "The `KFM` Handbook" Usage section for details).
2. Download, create, scan, and edit a favorite picture for use as a background for one of your KDE desktops, and then install the picture as your wallpaper.
3. Add different sounds to KDE's system events.
4. Change the orientation of the panel and taskbar to offer the maximum screen real estate for your display.

PART III

Connecting to the Outside World

Hour

9 Using Communications Programs

10 Connecting to the Internet

11 Configuring Internet Email

12 Configuring Internet News

13 Internet Downloading and Browsing

HOUR 9

Using Communications Programs

In this hour, you'll learn about communicating with the outside world using programs installed from this book's CD-ROM. You'll learn how to set up your serial port or modem, configure and use two communication programs, and send and receive faxes with Linux.

Although your CD-ROM contains all the software you need to run Linux communications programs, you do need a serial communications port and modem to dial out with your Linux system. I assume you're familiar with modems, communication terms such as baud rate, parity, or stop bits, and how to connect your modem to your computer.

Setting Up and Testing Your Modem

Your first task is to find your spare serial port. You should be able to find the port on the back of your computer, and it most likely has 9 or 25 pins. If you're using a laptop, you might have a 9-pin male serial port, an RJ-11 telephone jack for an internal modem, or a PCMCIA modem card with an RJ-11 telephone jack.

You can find your serial port in Linux by looking in the `device` or `/dev` directory. Many devices are defined there, such as hard drives, floppies, and printers, but you should look for devices of type `ttyS`, for example:

```
# ls /dev/ttyS*
/dev/ttyS0  /dev/ttyS1  /dev/ttyS2  /dev/ttyS3
```

These devices correspond to the traditionally defined DOS serial ports (with addresses that might be similar or different for your computer), as shown in Table 9.1.

TABLE 9.1 DOS AND LINUX SERIAL PORTS AND ADDRESSES

DOS Port	*Linux Device*	*Address*
COM1	`/dev/ttyS0`	`0x2F8 IRQ 4`
COM2	`/dev/ttyS1`	`0x2F8 IRQ 3`
COM3	`/dev/ttyS2`	`0x3E8 IRQ 4`
COM4	`/dev/ttyS3`	`0x2E8 IRQ 3`

If you have a laptop with a PCMCIA modem card, you can't use your modem (or any other PCMCIA devices) until you enable those services and tell Linux to look for PCMCIA devices when it starts. To enable your PC card modem, make sure you're logged in as the root operator, and then edit the file named `pcmcia` in the `/etc/sysconfig` directory to look like this:

```
PCMCIA=yes
PCIC=i82365
PCIC_OPTS=
CORE_OPTS=
```

This tells Linux to install PCMCIA services. Save the file, and then reboot Linux. Your PC card modem (and other PC cards, if installed) should be recognized during the reboot.

If you have trouble with PCMCIA devices, read David Hinds' PCMCIA-HOWTO, which you can find under the `/usr/doc/pcmcia` directory. If you want the latest information about PCMCIA support for Linux, browse to

`http://hyper.stanford.edu/HyperNews/get/pcmcia/home.html`

To download the latest drivers (kernel modules) for OpenLinux, go to

`ftp://csb.stanford.edu/pub/pcmcia`

If you have trouble with setting up your serial ports, read Greg Hankins' Serial-HOWTO, also under the `/usr/doc/HOWTO` directory. There is a complete discussion on setting up your serial ports and troubleshooting installation. To read the document, which is a compressed text file, use the `zless` pager, like so:

```
zless /usr/doc/HOWTO/Serial-HOWTO.gz
```


You can check to make sure that your serial ports are enabled by checking portions of the Linux startup message with the `dmesg` command. Pipe the output of the `dmesg` command through the `less` pager to display the boot messages and look for the Serial driver message like this (press the Q key when you're finished to quit):

```
# dmesg ¦ less
...
Serial driver version 4.13 with no serial options enabled
tty00 at 0x03f8 (irq = 4) is a 16550A
tty03 at 0x02e8 (irq = 3) is a 16550A
...
```

A portion of the `dmesg` file is reproduced here, so you can see what to look for. The output here indicates that the system has serial ports of the MS-DOS equivalent of COM1 and COM4 at the IRQs enclosed in parentheses. If you do not see a serial driver or serial port listing, you must make sure that serial-line support is enabled for your Linux kernel. By default, OpenLinux comes with serial support, so this is probably not a problem.

Test your modem interactively with the `minicom` program discussed in the section "Dialing Out with Communications Programs."

Creating `/dev/modem` with the `lisa` Command

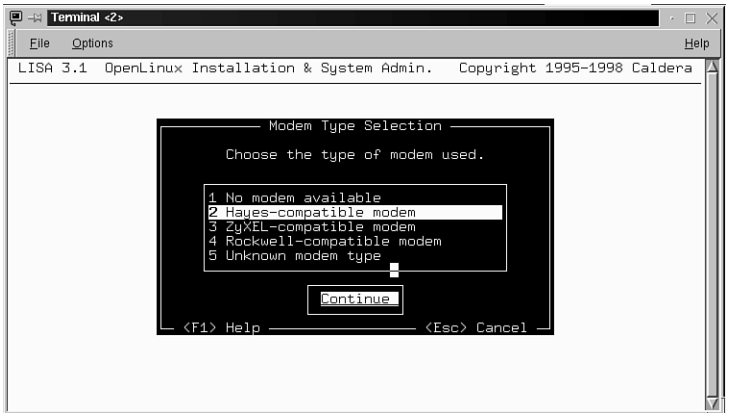
Use the `lisa` command to set up your modem. The `lisa` command creates a symbolic link, `/dev/modem`, after you select your modem type and modem serial port. Make sure you're running as the root operator, or use the `su -` command, and then start `lisa` with its `--modem` option, like this:

```
# su -c "lisa --modem"
```

After you press Enter, you see the `lisa` dialog box, as shown in Figure 9.1.

FIGURE 9.1

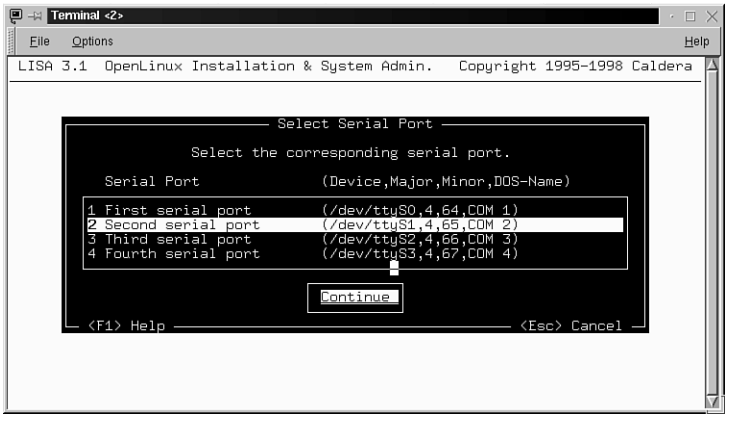
The `lisa` administration program configures the selected modem.



Scroll through the list of options to highlight the type of modem used with your computer (nearly all modems today are Hayes-compatible), and press Enter. The `lisa` command asks you to select the serial port used by the modem, as shown in Figure 9.2.

FIGURE 9.2

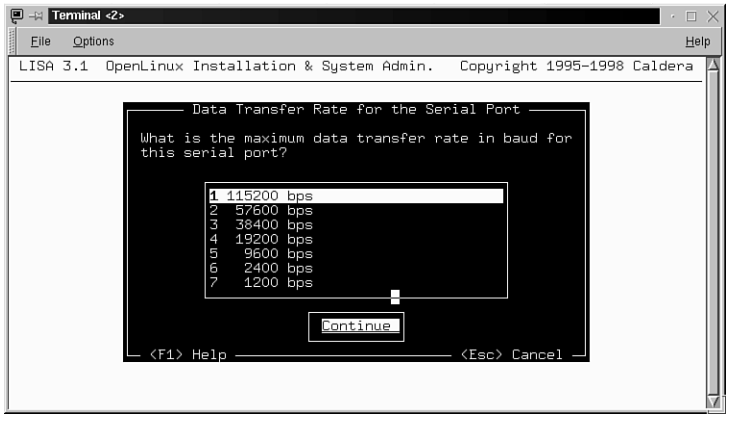
Scroll through the list of serial ports, and press Enter to select your modem's serial port.


Terminal <2>
File Options Help
LISA 3.1 OpenLinux Installation & System Admin. Copyright 1995-1998 Caldera
Select Serial Port
Select the corresponding serial port.
Serial Port (Device,Major,Minor,DOS-Name)
1 First serial port (/dev/ttyS0,4,64,COM 1)
2 Second serial port (/dev/ttyS1,4,65,COM 2)
3 Third serial port (/dev/ttyS2,4,66,COM 3)
4 Fourth serial port (/dev/ttyS3,4,67,COM 4)
Continue
<F1> Help
<Esc> Cancel

Scroll through the list of serial ports to highlight the serial port for your modem. After you press Enter, `lisa` asks you to select the highest speed used by your modem. If you have a 33.6 modem, select 57600 bps. If you have a 56K modem, select 115200 bps (as shown in Figure 9.3).

FIGURE 9.3

Scroll through the list of serial port speeds and press Enter to select the highest speed for your modem's serial port.



After you press Enter, you are asked to enter your fax number. Enter your fax number and press Enter, or just press Enter to finish configuring your modem. The `lisa` command quits and makes a symbolic link (discussed in Hour 5, "Manipulation and Searching Commands") from the selected device to a file called `/dev/modem`.

You can verify this operation by listing the file `/dev/modem` with the `ls` command, like so:

```
# ls -l /dev/modem
lrwxrwxrwx   1 root     root           5 Dec 29 15:43 /dev/modem -> ttyS0
```

You can do the same thing as `lisa` from the command line using the `ln` command to create the symbolic link yourself. For example, if you have your modem connected to COM2, make sure you're running as root, and enter the following:

```
# ln -s /dev/ttyS1 /dev/modem
```

This creates a symbolic link, `/dev/modem`, which points to the serial port connected to your modem.

Dialing Out with Communications Programs

This section covers two communications programs that come with your OpenLinux distribution: `minicom` and `seyon`. The `minicom` program can be used either with or without running X11. The `seyon` program must be used while you're running the X Window System.

There is also an old communications program, called cu, under the /usr/bin directory. This program is not as friendly as minicom or seyon, but if you're interested in setting up and trying this program, read the cu man page, and definitely read the uucp software documentation under the /usr/doc/uucp directory.

Setting Up and Calling Out with minicom

The minicom program, created by Miquel van Smoorenburg and located under the /usr/bin directory, is a friendly communication program you can use to dial out and connect with other computers or BBSs. You can use minicom without running X11. If you're running X11, you can try to use the xminicom shell script, which is also located under the /usr/bin directory.

The xminicom shell script, started by typing **xminicom &** at the command line of an X11 terminal window, might not work under the OpenLinux 1.3 distribution. However, here's a replacement for the xminicom you can use. Log in as the root operator, and then create a text file with your favorite text editor (such as pico, discussed in Hour 14, "Text Processing"), like this:

```
# pico -w xminicom
```

The -w option disables line-wrapping. Type in the following line:

```
xterm -bg black -fg green -cr red -n minicom -geometry 80x25
➥-e minicom
```

This command line starts an xterm terminal with a black background, green text, red cursor, the name minicom, use of 80 characters by 25 lines, and running the minicom program inside the window. If you're using pico, press Ctrl+X to save the file. Next, use the chmod command to make the text file an executable program, like this:

```
# chmod +x xminicom
```

Finally, copy the new xminicom command to the /usr/bin directory with the same or a different name.

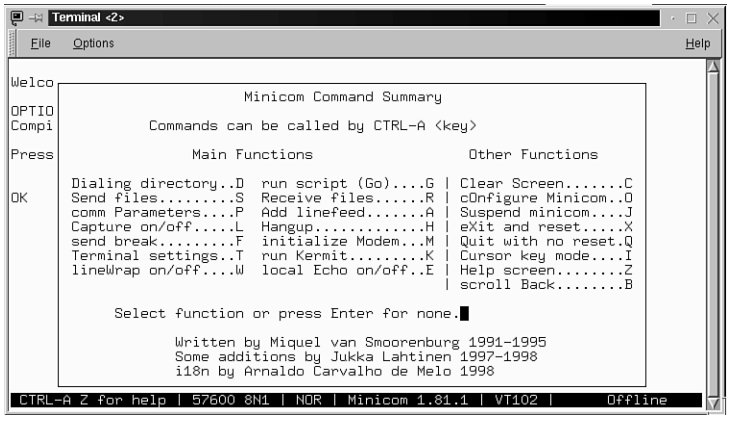
The first time you use minicom, make sure you're running as the root operator so you can set up and save minicom's default file, minirc.dfl, which is created and saved in the /etc directory. Assuming you're using X11, you can start minicom with the following:

```
# xminicom &
```

This command runs the xminicom script and starts minicom in an X11 terminal window. To get help on how to use minicom, press Ctrl+A, and then press the Z key. Figure 9.4 shows the minicom help screen.

FIGURE 9.4

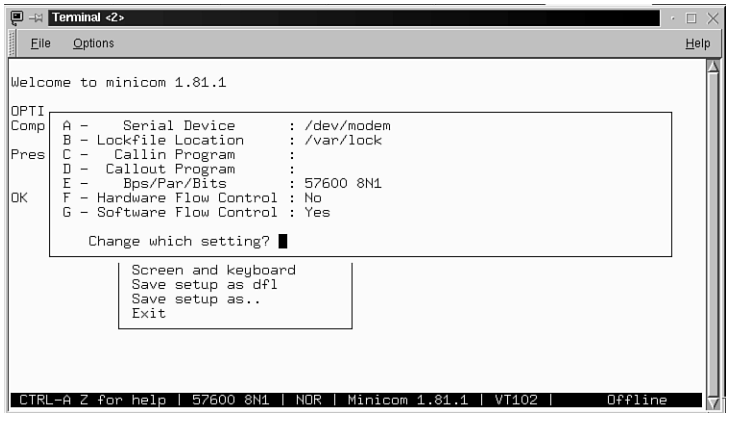
The `minicom` communications program features built-in help for the user.


Terminal <2>
File Options Help
Minicom Command Summary
Commands can be called by CTRL-A <key>
Main Functions Other Functions
Dialing directory..D run script (Go)....G | Clear Screen.....C
Send files.....S Receive files.....R | cOnfigure Minicom..O
comm Parameters....P Add linefeed.....A | Suspend minicom....J
Capture on/off.....L Hangup.....H | eXit and reset.....X
send break.....F initialize Modem...M | Quit with no reset.Q
Terminal settings..T run Kermit.....K | Cursor key mode....I
lineWrap on/off....W local Echo on/off..E | Help screen.....Z
| scroll Back.....B
Select function or press Enter for none.
Written by Miquel van Smoorenburg 1991-1995
Some additions by Jukka Lahtinen 1997-1998
i18n by Arnaldo Carvalho de Melo 1998
CTRL-A Z for help | 57600 8N1 | NOR | Minicom 1.81.1 | VT102 | Offline

To configure `minicom`, press Ctrl+A, and press the O key to get to the configure screen. Scroll down and select Serial Port Setup, and press the Enter key. You can then type in the Serial Device by pressing the A key. Type in the device your modem is connected to, such as `/dev/ttyS1`, or the symbolic link, `/dev/modem`, if you created the link. Figure 9.5 details the serial port setup screen.

FIGURE 9.5

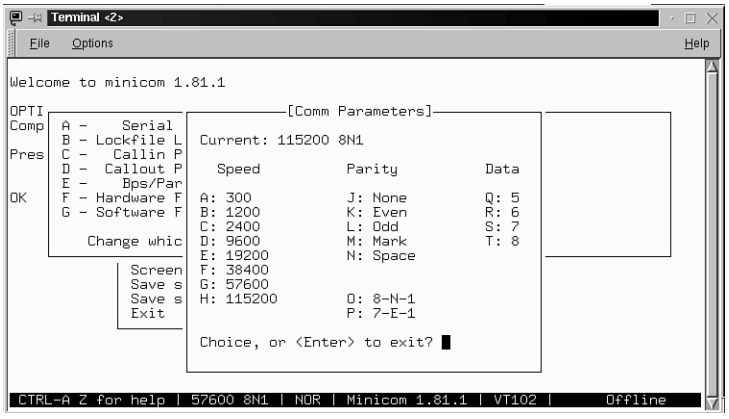
Configure the serial port for `minicom` by pressing a letter and typing a new value.


Terminal <2>
File Options Help
Welcome to minicom 1.81.1
A - Serial Device : /dev/modem
B - Lockfile Location : /var/lock
C - Callin Program :
D - Callout Program :
E - Bps/Par/Bits : 57600 8N1
F - Hardware Flow Control : No
G - Software Flow Control : Yes
Change which setting?
Screen and keyboard
Save setup as dfl
Save setup as..
Exit
CTRL-A Z for help | 57600 8N1 | NOR | Minicom 1.81.1 | VT102 | Offline

For example, to change your modem's speed, press the letter E. A new dialog box appears, as shown in Figure 9.6. To change the baud rate, press the key corresponding to the letter next to the desired baud rate. When you finish, press Enter to return to the serial setup dialog box.

FIGURE 9.6

Set a new serial port speed for your modem by pressing a letter.



Press the Enter key, select Save setup as dfl, and press the Enter key again, followed by the Escape key. Your system defaults should be set. You can then try to call out with the following (substituting the correct phone number for *XXX-XXXX*):

ATDT*XXX-XXXX*

This command uses the modem's `AT` command, `DT`, to dial out using a dial tone (for a full list of your modem's commands, consult your modem's manual). After you press Enter, your modem dials the phone number. To exit the program, press Ctrl+A, press X, and then press Enter.

If you have a number of phone numbers of other computers to call, you can enter them in `minicom`'s phone directory. You can also set up `minicom` to send or retrieve files using different file transfer programs. For details about these and other features, read the `minicom` manual page. You can also find documentation under the `/usr/doc/minicom` directory, which contains extensive details of using other features of this program.

Setting Up and Calling Out with the `seyon` X11 Client

The `seyon` communications program, by Muhammad M. Saggaf, runs only under the X Window System and has an extensive list of features. Although `seyon` is not as simple or initially friendly as `minicom`, it does have the following:

- Built-in help
- A built-in telecommunications scripting language to automate calling up and logging in to other computer systems
- A built-in text editor for writing telecommunications scripts

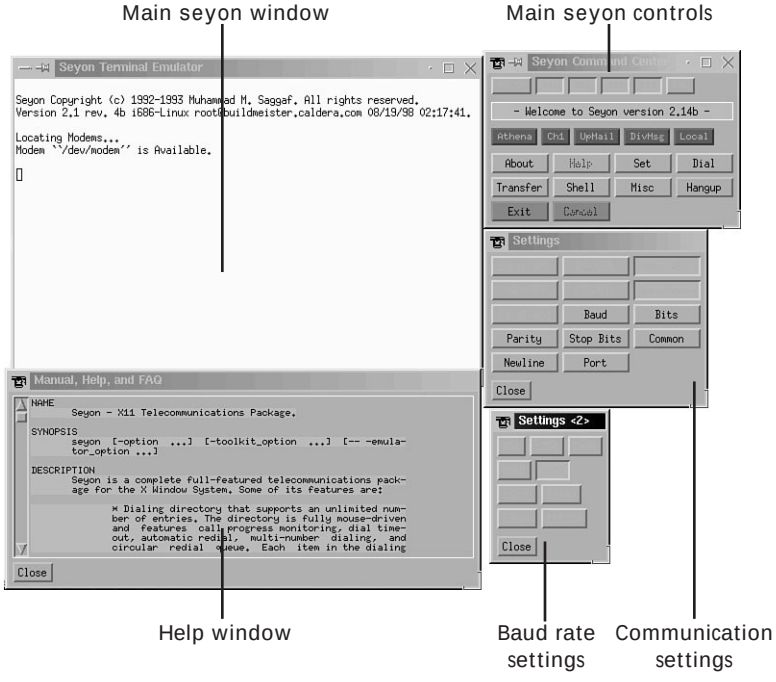
- A command-line shell dialog box for running commands, which displays output in the main communication window
- Buttons to set up modem speed, parity, and stop bits

If you created a symbolic link to `/dev/modem`, the `seyon` program automatically recognizes and works with your modem. All you have to do to call out and connect with another computer is to type your `AT` command string with the phone number to dial out and connect.

If you need to tell the `seyon` client the specific device for your modem, click on the Set button in the `seyon` Command Center window (which appears automatically when you start the client) to bring up the Settings window. Click on the Port button in the Settings window, and type in the name of the device, `/dev/cua1` for example, in the Values? window. Figure 9.7 shows `seyon` and its settings windows.

FIGURE 9.7

The X11 client, `seyon`, has point-and-click convenience for modem setup.



Click on the OK button, and click on the Close button of the Settings window. If you want to start the `seyon` program with a default modem speed, number of bits, or parity, edit the file `$HOME/.seyon/`. This directory is installed automatically when you install the `seyon` program. You can make changes to the following lines in the startup file:

```
...

# set baud
set baud 19200

# can be 5, 6, 7, or 8
# set bits 8
set bits 8

# can be 0 (= no parity), 1 (= odd parity), or 2 (= even parity)
# set parity 0
set parity 0

# can be 1 or 2
# set stopBits 1
set stopBits 1
...
```

If you need help when using the `seyon` program, you can click on the Help button in the `seyon` Command Center window. A window pops up with the `seyon` manual page, and you can scroll through the text for help (the help screen is shown in Figure 9.7).

Setting Up Your Linux System for Dialing In

You can also set up your OpenLinux system so that your computer's modem answers the phone and enables you to log in. You can then run a bulletin board system (BBS), word processors, and spreadsheet programs. You can even dial out on another line if you have at least two modems connected to your computer and two phone lines in your home.

Most of the details and custom configurations are in the Serial-HOWTO under the `/usr/doc/HOWTO` and `/usr/doc/getty_ps` directories, but the three basic steps outlined here should work for nearly any modem.

Setting up your OpenLinux system to accept incoming calls involves editing the `/etc/inittab` file and can potentially hang your system if you make an error. Always have a backup boot disk handy, and make a copy of the `/etc/inittab` file before you make changes.

First, log in as the root operator, and run `minicom`. Use the `AT` command `&V` to display your modem's profile, or default setup, for example:

```
AT&V
ACTIVE PROFILE:
B1 E1 L1 M1 N1 Q0 T V1 W0 X4 Y0 &C1 &D2 &G0 &J0 &K3 &Q5 &R1 &S0
➥&T5 &X0 &Y0 ~Z0
```

```
S00:000 S01:000 S02:043 S03:013 S04:010 S05:008 S06:004 S07:045
➥S08:002 S09:006
S10:014 S11:095 S12:050 S18:000 S25:005 S26:001 S36:007 S37:000
➥S38:020 S44:020
S46:138 S48:007 S51:012 S52:012 S53:010 S54:010 S95:000
```

You might see other values for your modem's internal profile and registers, but you need to make sure that your modem is at least set to the following:

```
E1 Q0 V1 S0=1 &C1 &S0
```


You can set your modem to these values by using the `AT` command, for example:

```
ATE1Q0V1S0=1&C1&S0&W
OK
```

Note that at the end of the `AT` command string, using the `&W AT` command saves the modem configuration as a default. You can also see the `OK` prompt echoed back to you from your modem after entering the string, and you can again issue the `AT&V` command to verify the settings.

The second step is to create a directory named `default` under the `/etc` directory, like this:

```
# mkdir /etc/default
```

Then, use the `cp` command to copy the file `uugetty.autoanswer` from the `/usr/doc/getty_ps` directory, renaming the file to match your modem's serial port device, like so:

```
# cp /usr/doc/getty_ps-2.0.7h/Examples/uugetty.autoanswer
➥/etc/default/uugetty.ttyS0
```

This command line shows that the desired serial port is `/dev/ttyS0`, which corresponds to the DOS COM1 port. Now edit the copied file with your favorite text editor, and look for the following line:

```
ALTLOCK=cua2
```

Change the default values of `cua2` to match the extension and serial port of your modem, like this:

```
ALTLOCK=ttyS0
```

Save the file and exit your editor.

The final step involves a one-line edit of `/etc/inittab`, the system initialization table. If you look in this file, you see these lines:

```
# less /etc/inittab
...
# Run gettys in standard runlevels
```

```
1:12345:respawn:/sbin/getty tty1 VC linux
2:2345:respawn:/sbin/getty tty2 VC linux
3:2345:respawn:/sbin/getty tty3 VC linux
4:2345:respawn:/sbin/getty tty4 VC linux
5:2345:respawn:/sbin/getty tty5 VC linux
6:2345:respawn:/sbin/getty tty6 VC linux
...
```

Each of the lines represents a different Linux `runlevel` documented at the beginning of the `/etc/inittab` file. This discussion doesn't cover `runlevels` or the details of how OpenLinux boots, but all you have to do to enable dial-in logins for your Linux system is to change the following line:

```
3:2345:respawn:/sbin/getty tty3 VC linux
```

Change it as follows:

```
3:2345:respawn:/sbin/uugetty ttyS0 38400 vt100
```

Save the file, and use the shutdown command to restart your system. This `inittab` entry tells OpenLinux to start the `getty` command after you boot and have `getty` monitor your `/dev/ttyS0` serial port for incoming calls. The value `38400` is not a modem baud rate but corresponds to an autobaud entry (which works at `38400` or lower speeds) in the `/etc/gettydefs` file. If you call in to your OpenLinux system, the modem synchronizes with your calling modem's speed and then presents a login prompt.

When you log in to OpenLinux, the contents of the `/etc/issue` file are printed on your display right before the login prompt. This file is created by the startup script `rc.local` in the `/etc/rc.d` directory every time you start OpenLinux as part of the booting process. As the root operator, you can customize the `rc.local` script to change the contents of the `/etc/issue` file if you want a different login banner.

If you set up your system to accept incoming calls and want to use `minicom`, run `minicom` as the root operator. Then configure the serial device name under serial port setup in the configuration menu to match the name of your modem's actual device, such as `/dev/ttyS1`, and make sure the name is not a symbolic link, such as `/dev/modem`.

Sending and Receiving Faxes

If your modem supports fax protocols, chances are that you can send and receive faxes using OpenLinux. Sending and receiving faxes under OpenLinux involves graphics translation of both received files and files you want to send. Your OpenLinux distribution on the CD-ROM contains the `efax` family of fax software and documentation. Have your modem's documentation on hand and read the `efax` manual pages and documentation under the `/usr/doc/efax` directory carefully before you start.

Faxing with the `efax` System

The `efax` system, by Ed Casas, is a simple and easy-to-use fax system that, according to its documentation, is best suited to a single-user, standalone Linux system. This software consists of a series of programs and scripts and supports Class 1 and 2 fax modems.

The system is made up of the following programs:

- `/usr/bin/efax`—The faxing program
- `/usr/bin/efix`—A graphics conversion program used to prepare text files for faxing or to convert files to different graphics formats
- `/usr/bin/fax`—A shell script used to create, send, receive, display, or print fax files

If you want to preview or fax PostScript graphics files, you also need to have the `gs` PostScript interpreter and companion viewer, `gv`, installed on your system. For viewing received faxes, you can use the X11 client `xv` (discussed in Hour 16, "Graphics Tools").

You need to edit the `/usr/bin/fax` script to configure faxing. But before you make changes to the script, do yourself a favor and make a copy first. If you make errors or delete the file, you need a copy to reinstall the `efax` software.

Before you start sending or receiving faxes, take a look at the `/usr/bin/fax` shell script. This program is the front-end to fax service with `efax`, but you need to check several sections in the file to make sure the script is configured properly. For example, the first section lists the names of the `efax` programs:

```
FAX=/usr/bin/fax
EFAX=/usr/bin/efax
EFIX=/usr/bin/efix
```

These should not pose a problem because the programs are installed in the correct place when you installed the software. The next section lists your modem:

```
DEV=modem
```

You can use the word `modem` if you created a symbolic link. However, if you have Linux set up to answer incoming calls for logins, use the actual name of the device (such `ttyS0`, using our previous example). The next section to check is the type of faxing your modem supports:

```
# CLASS=1
CLASS=2
# CLASS=2.0
```

Comment or uncomment the proper support by using the pound sign (`#`), but make sure only one `CLASS` is listed. For example, if your modem supports the minimal Class 1 fax service, change these entries to look like the following:

```
CLASS=1
# CLASS=2
# CLASS=2.0
```

After this, you can customize your faxes with your phone number:

```
# Use only digits, spaces, and the "+" character.
FROM="0 000 000 0000"
# Your name as it should appear on the page header.
NAME="Your Name Here"
```

Enter your phone number in the `FROM` line, such as “1 202 555 1212”, and change the `NAME` entry to your name, such as “Eric Goldfarb”. Finally, set the default page size for faxing, for example:

```
 PAGE=letter
# PAGE=legal
# PAGE=a4
```

Comment or uncomment the different page sizes, but use only one. After you finish making your changes, try the `fax` command to test your configuration and modem, using the `test` command-line option, for example:

```
# fax test
---------------------------------------

Please wait, this will take a minute...

---------------------------------------
--- /usr/bin/fax ---
```

```
FAX=/usr/bin/fax
EFAX=/usr/bin/efax
EFIX=/usr/bin/efix
DEV=cua1
CLASS=2
...
```

You get a three-page listing of information about your configuration and your modem's response to the fax script's queries. If you want to see this information at your leisure, redirect the output of the text to a file, for example:

```
# fax test > faxtest.txt
```

You can then read about any error messages or problems with missing software. Assuming everything is okay, you can then try faxing a document using the `fax` command:

```
# fax send -l 8207442 faxtest.txt
```

The `-l` option tells the `fax` program to send a low-resolution (98 lines per inch) fax, using the fax testing information you created. To send a high-resolution (196 lines per inch) fax, no option is needed, for example:

```
# fax send 8207442 faxtest.txt
faxtest.txt.nnn is up-to-date
/usr/bin/efax: Tue Dec 29 21:38:02 1998 efax v 0.8a Copyright 1996
➥Ed Casas
efax: 38:02 opened /dev/modem
efax: 38:03 dialing T8207442
efax: 38:26 connected
efax: 38:32 session 196lpi  9600bps 8.5"/215mm 11"/A4 1D  -   -  0ms
efax: 38:32 header:[98/12/29 21:38  Eric Goldfarb (1 317 123 1234)
➥-->  8207442  p. 1/3]
efax: 39:06 sent 20+2156 lines, 38961+0 bytes, 34 s  9167 bps
efax: 39:09 sent -> faxtest.txt.001
efax: 39:10 header:[98/12/29 21:38  Eric Goldfarb (1 317 123 1234)
➥-->  8207442  p. 2/3]
efax: 39:37 sent 20+2156 lines, 32200+0 bytes, 27 s  9540 bps
efax: 39:40 sent -> faxtest.txt.002
efax: 39:41 header:[98/12/29 21:38  Eric Goldfarb (1 317 123 1234)
➥-->  8207442  p. 3/3]
efax: 39:50 sent 20+2156 lines, 9635+0 bytes, 9 s  8564 bps
efax: 39:55 sent -> faxtest.txt.003
efax: 39:56 done, returning 0
```

As you can see, the fax script automatically recognizes that your file is a text file because of the extension. You can also send PostScript graphics files by fax. If you want to test sending such a graphic, try this command line:

```
# fax send 8207442 /usr/share/ghostscript/4.03/examples/tiger.ps
```

The `fax` shell script converts the PostScript graphic to fax format and sends it to the remote fax (albeit in black and white, not color).

To set your computer to automatically wait for incoming faxes, you can use the fax script's `wait` command-line option, for example:

```
# fax wait
running /usr/bin/fax answer
/usr/bin/efax: Tue Dec 29 22:38:02 1998 efax v 0.8a Copyright
➥1996 Ed Casas
```

You can also use the background operator to put the shell script in the background. You can check on the status of your Linux fax machine with the `status` command-line option, for example:

```
# fax status
USER   PID %CPU %MEM  SIZE  RSS TTY STAT START TIME COMMAND
root   785  1.8  0.6  1032  404  p2 S <  21:45 0:00 /usr/bin/efax -d/dev/

from: /var/spool/fax/modem.785

efax: 45:23 opened /dev/modem
efax: 45:25 waiting for activity
```

This shows that the `efax` command is waiting on the `/dev/modem` serial port for incoming faxes. To check whether you've received any faxes, you can use the `fax` command's `queue` command-line option, for example:

```
# fax queue

Fax files in /var/spool/fax :

-rw-r--r--   1 root     root        18449 Dec 29 21:51 1229215055.001
-rw-r--r--   1 root     root        15001 Dec 29 21:54 1229215350.001
-rw-r--r--   1 root     root        16229 Dec 29 21:54 1229215350.002
```

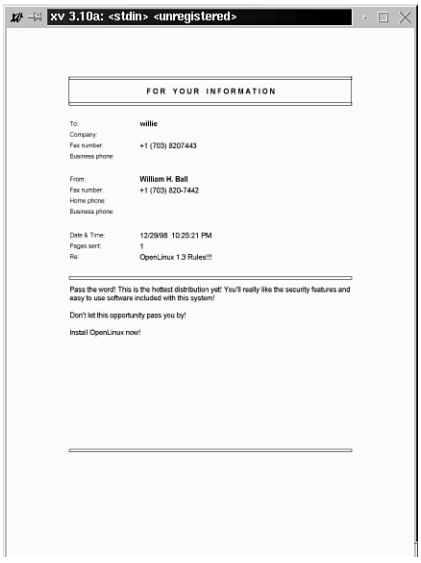
This output shows that two faxes have been received. The first is a one-page fax received at 9:51 p.m. The other is a two-page fax received three minutes later. These faxes are waiting in the `/var/spool/fax` directory (created automatically when you first run the `fax` command with the `wait` command-line option). Each page of a fax is saved as a separate file, and pages of the same fax have the same filename with the date and time, followed by the page number as an extension.

To view a fax, you can use the `fax` command's `view` option. For example, to view the one-page fax, as shown in Figure 9.8, use the `fax` command with the `view` option, followed by the fax's filename, like this:

```
# fax view 1229215350.001
/var/spool/fax/1229215055.001
1229215055.001 ...
```

FIGURE 9.8

The `fax` command automatically runs the X11 `xv` graphic program to view or print your incoming faxes.


xv 3.10a: <stdin> <unregistered>
FOR YOUR INFORMATION
To: willie
Company:
Fax number: +1 (703) 8207443
Business phone:
From: William H. Ball
Fax number: +1 (703) 820-7442
Home phone:
Business phone:
Date & Time: 12/29/98 10:25:21 PM
Pages sent: 1
Re: OpenLinux 1.3 Rules!!!
Pass the word! This is the hottest distribution yet! You'll really like the security features and easy to use software included with this system!
Don't let this opportunity pass you by!
Install OpenLinux now!

To view all the pages of a fax, use a wildcard, such as an asterisk (`*`), with the first part of a multiple page fax name. To use the previous two-page fax as an example, type a command line like this:

```
# fax view 1229215350.*
```

The `fax` program cycles through the files and displays each page with the viewer you specified in the `fax` shell script. You can use the X11 `xv` client to print your faxes, or you can try the `fax` command's `print` command-line option to print your faxes, for example:

```
# fax print 1229215350.001
/var/spool/fax/1229215055.001
1229215055.001 ...
```

This prints the first page of the incoming fax. You can print all the pages of a multiple page fax with the following:

```
# fax print 1229215350.*
```

If you want to delete a fax, use the `rm` command, for example:

```
# rm /var/spool/fax/1229215350.*
```

If you want, you can try to use the `fax` command's `rm` command-line option. However, this is potentially dangerous and might delete files in the current directory, especially if you use a plain asterisk (`*`) as a filename. You should specify the fax filenames explicitly when using this command-line option.

The `efax` family of commands is a simple and versatile way to send and receive faxes with Linux. The `fax` command has more commands than are documented in the manual page, including support for voice modems and creating cover pages. Read the `fax` command itself for more details.

Sending Fax Documents with the `ksendfax` Client

If you use the K Desktop Environment, or KDE, you can use `ksendfax` to quickly select and send a fax. Although not included with the KDE distribution on your OpenLinux CD-ROM, you can download a copy from `http://www.kde.org`. Follow the links to the Applications section and download the file `ksendfax-0.3.1.tar.gz`. Building and installing `ksendfax` is easy. First log in as the root operator and decompress the file with the `tar` command, like this:

```
# tar xvzf ksendfax-0.3.1.tar.gz
```

Change the directory into the `ksendfax` directory, and then build and install the package by using the `configure` and `make` commands, like this:

```
# configure; make install
```

The `ksendfax` client is installed. If you're logged in as the root operator, start `ksendfax` by clicking the Application Starter button on your desktop's panel, selecting the Graphics menu, and then clicking the KsendFax menu item. However, if you're not logged in as the root operator, start the program from the command line of a `kvt` terminal window, like this:

```
# su -c ksendfax
```

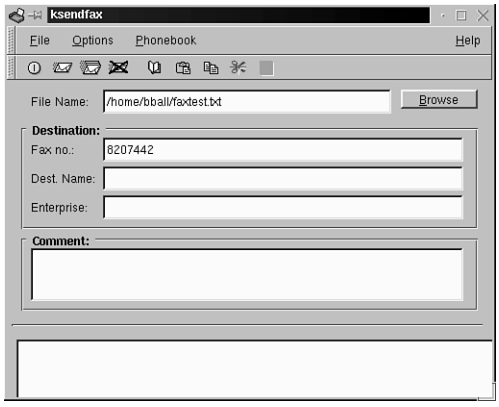
The main dialog box appears. Type in a filename to send in the File Name section, or click the Browse button to choose a file. Next, type in the remote fax machine's number in the Fax no. field, as shown in Figure 9.9.

To configure `ksendfax` with your favorite fax program, such as `efax`, click the Preferences menu item under the Options menu. Next, type in the command string for `ksendfax` to use to send a fax (as shown in Figure 9.10). For example, to use the `fax` script with `ksendfax`, enter the following:

```
/usr/bin/fax send '@@Phone' '@@FName'
```

FIGURE 9.9

Using the `ksendfax` client is an easy way to send a fax.

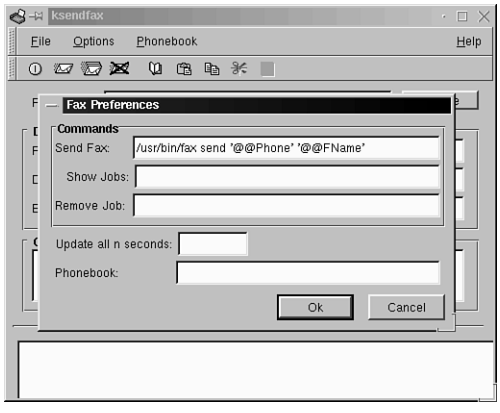


When you finish, click the OK button. To send the fax document, press Ctrl+S, click the Send Fax button, or click the Send Fax menu item under the File menu. A small dialog box appears, showing the communications progress of your faxing operation.

To find out how to configure `ksendfax` for other fax programs for OpenLinux, click the Help menu item under the `ksendfax` Help menu. There are tips and tricks on getting `ksendfax` to work with at least three different fax software packages.

FIGURE 9.10

To use `ksendfax` with your fax program, you must enter a command string in the Preferences dialog box.



Sending Fax Documents with `mgetty+sendfax`

`mgetty+sendfax` is a package of software that uses the `mgetty` command, which you install in `/etc/inittab` much like the `uugetty` example shown previously, and the `sendfax` program, which is used to send faxes. The installation and configuration of this software is a little more complicated than setting up `efax`. This section shows you how to set up, configure, and use this software to send and receive fax documents with your modem.

This package of software includes many files (too many to list here). The examples in this section concentrate on the important ones and show you how to configure the `sendfax` software and quickly send a fax. Your first step is to make sure you're logged in as the root operator. You need to change the directory to the `mgetty+sendfax` directory under the `/etc` directory. You see a number of files there, for example:

```
# ls -A
dialin.config   fax.deny      faxrunq.config  mgetty.config   voice.conf
fax.allow       faxheader     login.config    sendfax.config
```

Your first job is to create the `fax.allow` and `fax.deny` files if they do not exist. In the `fax.allow` file, enter the names of users you want to enable to have fax service. Enter at least two names: root and your username.

Next, edit the `faxheader` file, and enter your name and phone in the sample header line, for example:

```
FAX  FROM:  John H. Doe 1 202 555 1212    TO: @T@    PAGE: @P@ OF @M@
```

You should use the comment character, `#`, when you make changes to the `sendfax` configuration files, and retype your changes on a new line. This saves you trouble if you make mistakes and need to return the file back to its original state.

The sample header line appears across the top of your faxed pages on the receiving fax machine. Next, edit the `sendfax.config` file, then look for the fax-devices section, and change the name of the device your modem is attached to (such as `/dev/ttyS1` for COM2), for example:

```
# which devices to use for outgoing faxes
#fax-devices tty4c:tty4d
fax-devices ttyS1
```

This tells the sendfax programs that your fax modem is attached to /dev/ttyS1. Next, enter your fax number, which is sent to the remote fax machine, for example:

```
# which fax number to transmit to the receiving station
#fax-id 49 89 xxxxxxxx
fax-id 1 317 123-1234
```

This identifies your fax machine to the remote fax. You also need to enter the type of dialing you want to use when sending a fax, for example:

```
# which command is used to dial out? (Could be ATD, ATDP, ATX3D0W...)
#dial-prefix ATD
dial-prefix ATDT
```

This tells the sendfax software that you want to dial out using tone dialing. Save the file, and exit your text editor. At this point, you're almost ready to start sending faxes.

To send a one-page fax using the sendfax program, you must first convert a text file into the Group 3 fax format. You can do this by using the graphics conversion program pbmtext, found under the /usr/bin directory with the pbm2g3 program, for example:

```
# cat myfile.txt ¦ pbmtext ¦ pbm2g3 > myfile.g3
```

This pipes the file myfile.txt through the pbmtext command, which outputs a portable bitmap graphics format into the pbm2g3 command, which then converts the piped stream of characters into the fax graphic format. After you do this, you can send the file (assuming you're the root operator) with the following:

```
# /usr/sbin/sendfax -v -l ttyS1 -C cls2 -r 5551212 myfile.g3
Trying fax device '/dev/ttyS1'... OK.
Dialing 5551212... OK.
sending 'myfile.g3'...
```

This runs the sendfax program. The -v command-line option tells sendfax to give some feedback during the faxing operation. I specify the ttyS1 serial port with the -l option and send the fax through a Class 2 fax modem with -C cls2 command-line option. The phone number 555-1212 is specified with the -r option, and the file, myfile.g3, is the file you created with the preceding command-line pipe.

Unlike efax, the sendfax command only supports Class 2 fax modems. If you have a Class 1 modem, use the fax shell script.

You can also set up your Linux system to automatically receive incoming faxes with the `mgetty` program. Used much like the `uugetty` program, `mgetty` also requires at least one change to its configuration file in the `/etc/mgetty+sendfax` directory. The change you can make (as the root operator) is to edit the phone identification entry in the file `mgetty.config`, for example:

```
# set the local fax station id
#fax-id 49 89 xxxxxxxx
fax-id 1 317 123 1234
```

This sets the local fax machine phone number. After you do this, edit the `/etc/inittab` file as described earlier, and use `mgetty` to listen to the serial port, for example:

```
3:2345:respawn:/usr/sbin/mgetty -s 38400 ttyS1
```

As mentioned before, any edits of the `/etc/inittab` file are potentially hazardous. Always have a spare boot disk and make a backup of the file first.

After you make this change, save the file, and reboot the computer. Now, not only are you able to receive faxes, but you can also dial in from an outside line and run Linux programs. To see if any faxes have arrived, you have to explicitly look at the `/var/spool/fax/incoming` directory, for example:

```
# ls -A /var/spool/fax/incoming
fn4878f9aS1-_IBM-APTIVA-M61-_.01  fn4878f9aS1-_IBM-APTIVA-M61-_.02
```

This shows that there is a two-page fax awaiting reading. You can read the faxes by first converting them to the portable bitmap file format, for example:

```
# cat /var/spool/fax/incoming/*.01 ¦ g32pbm > faxpage1.pbm
```

After you convert these fax files to the portable bitmap format, you can then use the X11 `xv` client or the ImageMagick display X11 program to read or print your faxes.

As you can see, you have several choices of software when faxing documents with OpenLinux. The `sendfax` program has many other options. Read its man page and documentation under the `/usr/doc/mgetty+sendfax` directory to find out the details.

Summary

This hour showed you how to configure your OpenLinux system to work with your computer's modem. You also learned how to set OpenLinux to answer incoming calls and how to send and receive fax documents.

Q&A

Q I'd like to learn more about modems and faxing. What resources are there?

A First, read the documentation for the `efax` and `mgetty+sendfax` programs to learn more about using these programs with OpenLinux. If you'd like to read a good, non-specific operating system overview of using modems and modem software, read Peter Chen's What You Need to Know about Modems, at `http://www.vix.com/flexfax/Modems-PeterChen`.

Q I'd like to turn off the high-pitched squeal my modem makes when it connects. How do I do this?

A Read your modem's documentation for the specifics, but in general, the `ATM0` command turns off your modem.

Q I want to hear the modem dial out and connect, but I don't want it to be so loud!

A Try using the `ATM1` command to enable sound, and then try to use the `ATL`*x* command, where *x* represents a number from `0` (low) to `3` (high) speaker volume. This feature is not supported by all modems.

Q My modem sometimes disconnects during my on-line sessions!

A If you have call waiting, it is possible that an incoming call can disrupt your modem. Try adding `*70` to the front of any dial string (such as `ATDT*70`) to disable call waiting.

Exercises

1. Try to call a local Bulletin Board Service (BBS) and connect with the `seyon` or `minicom` program.
2. Create a graphic, then save it in PostScript format, and try to send it as a fax. See Hour 16 for more information on creating graphics during your OpenLinux sessions.

HOUR 10

Connecting to the Internet

In this hour, you'll learn how to set up your Linux system to connect to the Internet using the serial line Point-to-Point Protocol known as PPP. Connecting to the Internet is one of the biggest hurdles many new OpenLinux users face after installing OpenLinux, configuring OpenLinux to work with their computer's sound card, and configuring the X Window System to work with their computer's graphics card. After following the directions in this lesson, you can connect to the Internet through your Internet Service Provider (ISP), and do email, Web browsing, and file transfers.

This hour shows you how to connect to your ISP manually in the simplest, most basic way possible. I also point you to sources of information for more details so that you can troubleshoot or fine-tune your connection. You'll then learn how to use two easy-to-use graphical interface programs, `kppp` and `xisp`, to set up, start, and stop your PPP connection.

I'm recommending you use a PPP connection for a number of reasons:

- Although it's complex, it is easy to set up.
- You can find documentation and details on the protocol in a number of HOWTO documents.
- You can read the `comp.protocols.ppp` newsgroup about PPP and the `comp.os.linux.networking` newsgroup for specific Linux information.
- It offers security on both ends of the connection.
- It is a common protocol supported by nearly all ISPs.
- OpenLinux comes with several programs you can use to set up your PPP connection.
- It is flexible enough to accommodate different types of connections.

This hour starts by listing some of the hardware and software prerequisites for OpenLinux and then asks for some necessary information you need from your ISP. Using that information, you'll first create a set of customized scripts you can use to manually start or stop your connection. I'll then show you how to set up a PPP connection using two graphical interface programs: the `kppp` client for the K Desktop Environment and the `xisp` graphical interface client for X11.

You'll also learn about some handy utilities you can use to diagnose your connection and some other programs you can use to monitor your sessions.

Hardware You Need

You probably already have all the hardware you need: a modem, a modem cable if your modem is external, and a phone line. However, you must have a modem you can use with OpenLinux. You *cannot* use any of the following modems with OpenLinux:

- 3Com/U.S. Robotics 56K V.90 Winmodem
- 3Com/U.S. Robotics 56K Winmodem PC Card
- 3Com/U.S. Robotics Sportster 33.6 Winmodem
- Aztech Systems 56K PCI modem
- Cardinal 56K Windows Fax modem
- Diamond SupraMax 56K ISA/PCI modems
- Hayes 56K Accura V.90 PCI Win modem
- Motorola FM56 ISA/PCI modems
- Mwave adapters (but might work as sound card)

- Viking Components 56K ISA Windows modem
- WinStorm 56K PCI Data/Fax Speaker phone modem
- Zoltrix Phantom/Spirit 56K modems
- Any other modem requiring Windows-only software

If you plan to purchase a modem to use with OpenLinux, do not buy any modem considered a *winmodem*. These useless pieces of junk were recently introduced into the computer industry by manufacturers to save money and increase profits in hardware production. Winmodems use fewer chips than "real" modems and depend on operating system-specific software drivers (and your computer's CPU) in order to work. Unfortunately, many computer manufacturers (especially those that make and sell laptop computers) do not tell you that a provided or built-in modem does not work with any operating system other than Windows. Beware! If you're not sure about what modem to buy, get an external modem that works with any operating system, not just Windows.

One of the great things about OpenLinux is that it runs well even on older computers. Although graphics-intensive applications such as X can tax the capabilities of older, slower PCs, you don't need X11, a fancy display monitor, or a 16MB VRAM accelerated 3D video card to use PPP. You do, however, need a working serial port and modem.

If you're able to use your modem under Linux to dial out and connect using the `minicom` program or C-Kermit, chances are you won't have any problems. If you're using a laptop with a PC Card modem and the cardmgr PCMCIA device manager recognizes and initializes your modem, you should be okay, as any recognized card is identified and listed when you boot OpenLinux.

One way to check for serial-port recognition is to use the `dmesg` program, which displays the boot messages shown when you start OpenLinux. Run the `dmesg` program (piped through the `less` command), and look for lines in the output describing serial ports similar to these:

```
# dmesg ¦ less
....
tty00 at 0x03f8 (irq = 4) is a 16550A
tty01 at 0x02f8 (irq = 5) is a 16550A
tty03 at 0x02e8 (irq = 3) is a 16550A
....
```

Using `dmesg` is convenient, especially if the boot messages scroll by too fast for you to read. These lines show that three serial ports were found using the devices ttyS0, ttyS1, and ttyS3. Another consideration is your modem's speed. You might remember when 2400- or 9600-baud modems were the greatest innovation since touch-tone dialing. If you're still using an older modem and refuse to upgrade to the newer V.90 modems until model prices drop, you can still connect to the Internet with PPP; most older modems automatically synchronize with the newer models lodged in your ISP's modem bank.

Want to lessen the chances of problems when connecting with your ISP? Find out what modems your ISP uses, and buy the same model for your computer system.

If you want to listen to radio stations, watch live video, or upgrade your Red Hat Linux system through your phone connection, you want the fastest modem and Internet connection you can afford. Although I don't advocate you try to get any work done through a 1200- or (shudder) 300-baud connection (which borders on masochism, but can be done, as ATM machines prove), you can use email, FTP, and text-only Web browsing at 9600 speeds.

It's up to you, and besides, isn't that what OpenLinux is all about—freedom of choice?

Linux Software You Need

In order to set up your PPP connection, you need to make sure that your Linux kernel supports PPP. You might have PPP support compiled into the kernel or loaded as a module when you start Linux. One of the ways to check to see if PPP support exists on your system is to again use `dmesg`:

```
# dmesg ¦ less
...
PPP: version 2.2.0 (dynamic channel allocation)
TCP compression code copyright 1989 Regents of the University of
➥California
PPP Dynamic channel allocation code copyright 1995 Caldera, Inc.
PPP line discipline registered.
...
```

You see similar lines.

By default, OpenLinux loads PPP support via a loadable Linux kernel module. If you do not see PPP, you must either recompile the kernel with built-in PPP support, build the PPP module and use the `insmod` command to load the driver, or make sure you have selected the proper Linux kernel during your OpenLinux installation (with the word "modular" in its filename). You also need networking support enabled, especially TCP/IP. See Hour 2, "Installing Linux," for details.

You also need the `chat` program, found under the `/usr/sbin` directory, and part of the `pppd` daemon software package. The `chat` program is used during the dialing process to dial out and connect to your ISP's modem. Along with `chat`, you need the `pppd` daemon, also installed in the `/usr/sbin` directory. If `pppd` is installed, you can find a `ppp` directory under the `/etc` directory containing some or all of the following files:


```
# ls /etc/ppp
chap-secrets     options          ppp-on-dialer
connect-errors   pap-secrets      ppp-on
ip-up            ppp-off
```

If you don't see the `ppp-on` or `ppp-on-dialer` files, you can copy them from the `/usr/doc/ppp-2.2.0f` directory.

The first setup you learn during this hour requires you to make changes to the `ppp-on` file, which is an executable script. Next, you might want to check to see if the file `resolv.conf` exists under the `/etc` directory. If it doesn't, don't worry; it's a short file containing one or two lines, and I show you what to type in the file.

Finally, you might want to see if you have the `ifconfig`, `minicom`, `netstat`, `ping`, and `route` commands on your system. You use these later in this chapter to run some tests on your connection.

Need to look for a command? Try the `whereis` or `locate` commands like so: `whereis ifconfig` to see where the `ifconfig` command is located on your system or `locate ifconfig` to print a list of any files or directories using `ifconfig`.

Information You Need from Your ISP

In order to connect to the Internet using PPP through your ISP, you need to first, obviously, have a PPP account. When you sign up for your service, your ISP account representative most likely assumes you want a setup and software for either a Windows or Macintosh computer system. If you say "Neither. I'm using Caldera's OpenLinux," and the response you get is either a blank stare, dead air on the phone, or "What's Linux?" don't panic!

You might get lucky. Linux is growing in popularity, and many ISPs in the U.S. and around the world recognize and support Linux users. If your ISP is aware of Linux, ask for the minimum system requirements, any setup guides, or install tips. This book's CD-ROM contains the latest, stable releases of the software you need, so you don't have to worry anyway.

Assuming your ISP doesn't know about Linux, here's what you need from your ISP:

- Your account information, meaning your username (login name) and password, so you can log in to your ISP's computer.
- Your ISP's modem connect number(s), so you can dial out and connect.
- Whether your ISP assigns you a static Internet Protocol (IP) address or assigns your IP address dynamically (the examples in this hour assume dynamic addresses, but I show you where you can make changes for a static IP address).
- The IP addresses and names of your ISP's primary Domain Name Server and secondary Domain Name Server. This information goes into the `/etc/resolv.conf` file (as explained in this chapter's section "Editing the `resolv.conf` File") in the first example.

The DNS IP addresses are in the form of four 8-bit numbers, and look something like 205.198.114.1 or 205.198.114.20. These are the address or addresses of the servers used or maintained by your ISP that translate hostnames, such as `metalab.unc.edu`, into numeric IP addresses, so you can connect, query, or address other computers and users around the world. This section doesn't go into the details about the mechanics of IP addressing, and this book does not cover all aspects of networking under Linux. If you want more complete details, see the *Linux Network Administrators Guide* under the `/usr/doc/LDP/nag` directory.

- The name or IP address of your ISP's mail server, so you can send and retrieve mail (you might also need a separate username and password for your ISP's mail server). You need this information in Hour 11, "Configuring Internet Email."
- The name or IP address of your ISP's news server, so you can read Usenet news and subscribe to newsgroups. You need this information in Hour 12, "Configuring Internet News."

Finally, ask for the Uniform Resource Locator, or URL, of your ISP's World Wide Web home page and your home page, if your ISP provides this service. Your ISP's Web pages might provide technical bulletins, help files, or other information that helps in troubleshooting connections.

Setting Up a PPP Connection Manually

Armed with this information, you can now learn how to specify your ISP's DNS server and how to create or edit your connection script, `ppp-on`. Although specifying your ISP's DNS server (s) is not necessary to initiate or maintain your connection, you need this information later with the `kppp` and `xisp` clients and when you learn about Internet email and news.

Editing the `resolv.conf` File

This is a simple process. First, make sure you're logged in as the root operator. Then look in the `/etc` directory for a file called `resolv.conf`. If it's there, open it with your favorite text editor, such as `pico` (see Hour 14, "Text Processing"), and add the search keyword, followed by the domain name of your ISP, and the IP addresses of your ISP's DNS servers. If your ISP only has one, that's okay. If your ISP has more than one, that's okay too. Create and open the file, like so:

```
# pico /etc/resolv.conf
```

Enter the lines, using this format:

```
search erols.com
nameserver 205.198.114.1
nameserver 205.198.114.20
```

Close the file. That's all there is to do! Next, you create or edit a script you can use to start a PPP connection.

Editing the PPP Connection Scripts

Before you start, you should know that using this script is only one way to start a PPP connection. This approach requires you to be logged in as the root operator. You also learn a much simpler approach later in this chapter.

I don't go into the detailed methods because I want to get you online quickly. When you get a working connection, I suggest you take a look at the `pppd` manual pages, Robert Hart's PPP-HOWTO under the `/usr/doc/HOWTO` directory, Al Longyear's PPP-FAQ under the `/usr/doc/FAQ/PPP-HOWTO` directory, the ISP-Connectivity mini HOWTO, or any pertinent sections in the *Linux Network Administrators Guid*e under the `/usr/doc/LDP/nag` directory.

The first thing to do is to make sure you're logged in as the root operator. Then, look in the `/etc/ppp` directory for a file called `ppp-on`. If it's there, first make a copy (you can call it anything you want), or rename `ppp-on` to `ppp-on.org`. If `ppp-on` isn't there, copy it from the `/usr/doc/ppp-2.20f` directory. Listing 10.1 shows you parts of the script, written by Al Longyear:

LISTING 10.1 THE *ppp-on* CONNECTION SCRIPT

```
...
TELEPHONE=555-1212   # The telephone number for the connection
ACCOUNT=username     # The account name for logon (as in 'George Burns')
PASSWORD=password    # The password for this account (and 'Gracie Allen')
LOCAL_IP=0.0.0.0     # Local IP address if known. Dynamic = 0.0.0.0
REMOTE_IP=0.0.0.0    # Remote IP address if desired. Normally 0.0.0.0
...
DIALER_SCRIPT=/etc/ppp/ppp-on-dialer
...
exec /usr/sbin/pppd lock modem crtscts /dev/modem 57600 \
     asyncmap 20A0000 escape FF $LOCAL_IP:$REMOTE_IP \
     noipdefault netmask $NETMASK defaultroute connect \
        $DIALER_SCRIPT &
```

You need to change several parts of this script. For the most part, you only need to make a few changes. Some of the critical elements are the following:

`TELEPHONE`—Enter your ISP's modem connect number here.

`ACCOUNT`—Enter your username or login name (usually assigned by your ISP).

`PASSWORD`—Enter your password here (usually assigned by your ISP).

DIALER_SCRIPT—Enter the complete pathname of your dialing script, which uses the pppd daemon's companion chat program. The chat program does the dialing, connecting, and login for you. If you can't find a copy of this script, which is called ppp-on-dialer, look under the /usr/doc/ppp-2.2.0f directory. (Listing 10.2 shows the ppp-on-dialer script.)

If your ISP's computer does not present a login: and password: prompt, you have to change the ogin: and assword: strings in this script to match the ones from your ISP.

LISTING 10.2 THE *ppp-on-dialer* DIALING SCRIPT

```
...
exec /usr/sbin/chat -v                                  \
        TIMEOUT         3                               \
        ABORT           '\nBUSY\r'                      \
        ABORT           '\nNO ANSWER\r'                 \
        ABORT           '\nRINGING\r\n\r\nRINGING\r'    \
        ''              \rAT                            \
        'OK-+++\c-OK'   ATH0                            \
        TIMEOUT         30                              \
        OK              ATDT$TELEPHONE                  \
        CONNECT         ''                              \
        ogin:--ogin:    $ACCOUNT                        \
        assword:        $PASSWORD
```

Next, examine the pppd command line in the ppp-on script, and change /dev/modem to match the device your modem is connected to. If you want, you can use the approach outlined in Hour 9, "Using Communications Programs," to make a symbolic link from your modem's serial port to /dev/modem.

If you have a 14.4 modem, use 19200 as the numeric value; if you have a 28.8 or 33.6 modem, try 57600. If you have a 56K or V.90 modem, try using a value of 115200. You might be able to connect at a faster speed, especially with newer modems.

If your ISP assigns IP addresses automatically (dynamic IP addresses, or addresses that might be different each time you log in), you're all set. But if you must connect to a specific (static, or fixed) IP address, you need to remove the `noipdefault` option from the `pppd` command line in listing 10.1. You also need to change the `$REMOTE_IP` string to the IP address provided by your ISP (you can do this in the `pppd` command line or further up in the script in the `$REMOTE_IP` variable).

Finally, make sure both the `ppp-on` and `ppp-on-dialer` scripts are executable by checking with `ls -l` or modifying with the `chmod` program:

```
# chmod +x /etc/ppp/ppp-on*
```

You're now ready, assuming your modem is connected to your computer and your phone line is connected to your modem, to try a connection.

Manually Starting and Stopping PPP Connections

This section shows you how to connect to your ISP and start your Internet session. There are several ways to do this. The first way you see is the most basic way to connect with the `minicom` program without using the scripts you just created. Then, you learn how to use your PPP connection script, `ppp-on`.

The `minicom` program, discussed in Hour 9, is a communications program you can use to dial out and connect to other computers or information services, such as bulletin board systems, or BBSs. See the `minicom` manual page for more information.

Using `minicom` to Connect

Using `minicom` to connect with your ISP has an advantage in that your account information and password are not recorded in the system logs under the `/var/log` directory. You can use `minicom` each time you want to use the Internet, but you might find the process tedious. I'm showing you this approach first, because you might find it useful in verifying that the login and password entries you specified in your `ppp-on-dialer` script work.

Here is the step-by-step method. You can do this because one of `minicom`'s features is that it has the capability to quit without resetting your modem. This means you can use `minicom` to dial out, connect, and then quit, enabling you to start your PPP session with the `pppd` daemon. Make sure you enter your ISP's DNS server information in `/etc/resolv.conf` first! Here's how:

1. Run `minicom`.
2. Type **`ATDT`**, followed by your ISP's modem number.
3. Wait for the connection and your ISP's prompt, and then log in with your username and password. Note whether the login and password prompts are different. If so, write them down so you have the information you need to edit the `chat` program options in your `ppp-on-dialer` script. After you type your password and press Enter, you might see a string of garbage characters sent back from your ISP's computer; this is normal and indicates your ISP's computer has started PPP.
4. Press Ctrl+A, and then press Q to exit `minicom` without a modem reset.
5. From the command line, log in as the root operator, and then type the following:

```
# pppd -d detach /dev/modem &
```

After a second or so, you're connected! (Well, check first—try some of the programs discussed later.)

Using Your `ppp-on` Script to Connect

Using the `ppp-on` script to establish your PPP connection is easy. Make sure you're logged in as root, and type the following to start the connection:

```
# /etc/ppp/ppp-on
```

> You don't have to log in as the root operator to start a PPP connection with the `ppp-on` script. Use the `su` command instead, like so:
>
> `su -c /etc/ppp/ppp-on`
>
> Press Enter. After you enter the root password, the script runs.

Notice that you have to type the entire pathname to the script. If your connection works, you can either move the script to the `/usr/local/bin` directory or make a symbolic link to the script with the following (you can call it whatever you want; just don't use `pppd`):

```
# ln -s /etc/ppp/ppp-on /usr/local/bin/start-ppp
```

After you start the script, you can hear your modem connect to your phone line, dial out, and then connect with your ISP's modem. After several seconds, you are connected!

Here's a tip: if you don't like the sound of your modem or find it disruptive (especially if you have to work in a quiet environment), use your modem's AT command set to turn off the modem's speaker. Run `minicom`, then type ATM0, hit the Enter key, and then type AT&W, followed by the Enter key to save the settings. Now you can start stealth PPP connections! The first command turns of the speaker; the second command saves this setting to the modem's NVRAM (nonvolatile RAM).

Stopping the PPP Connection

To stop your PPP session, use the `ppp-off` script, found in the `/etc/ppp` directory. To use it, type the following:

```
# /etc/ppp/ppp-off
```

This script works by finding your network interface, `ppp0`, which you can test by using some of the programs in the next section and then using the `kill` command to kill the process ID of `ppp0` (the `kill` command is discussed in the next hour).

If you're interested in the details on setting up other serial-line connections, such as Serial-Line IP, or SLIP, look under the `/usr/doc/slip-login-2.1.2` directory.

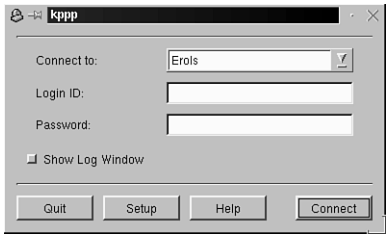
Configuring a PPP Connection with `kppp`

The `kppp` client included with KDE is an easy-to-use graphical interface you can use to configure, start, and stop PPP connections. This section shows you how to configure `kppp` to work with an ISP. You must be running X11 to use `kppp`, but you can use `kppp` without KDE.

To start the `kppp` client, type **`kppp`**, and press Enter at the command line of an X11 terminal window. If you're using KDE, click the Application Starter button on your desktop's panel, and then click Kppp from the Internet submenu. The `kppp` dialog box appears, as shown in Figure 10.1.

FIGURE 10.1

The kppp client can be used to set up, start up, and shut down PPP connections during X11 sessions.

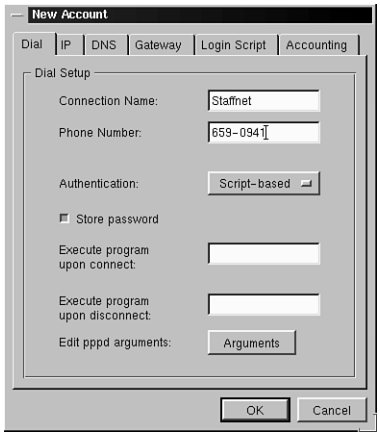


Configuring Your kppp Connection

Click the Setup button (shown in Figure 10.1) to start your configuration. The kppp Configuration dialog box appears. To define a new connection, click the New button. In the New Account dialog box, as shown in Figure 10.2, type a connection name and phone number.

FIGURE 10.2

The kppp client's New Account dialog box is used to define PPP connections.

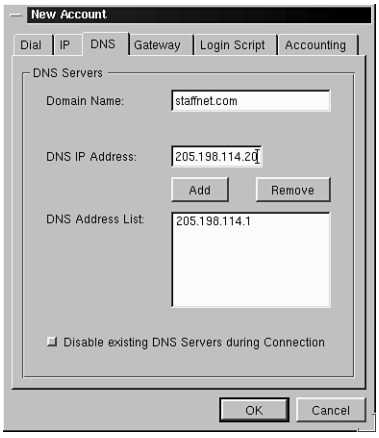


When you finish, click the IP tab at the top of the dialog box. If you have a static (assigned) IP address, click the Static IP Address button, and then enter the address. If you have a dynamic (randomly assigned) IP address, click Dynamic IP Address. When you finish, click the DNS tab to display the DNS Servers entry dialog box, as shown in Figure 10.3.

First, type your ISP's domain name, and then enter the first IP address of your ISP's DNS server. Next, click the Add button to add the IP address to the kppp list. Repeat this step until you enter all the DNS IP addresses. When you start a connection with kppp, the program temporarily adds these addresses to `/etc/resolv.conf` and then deletes the entries when you close the connection. When you finish entering the DNS addresses, click the Login Script tab in the dialog box.

FIGURE 10.3

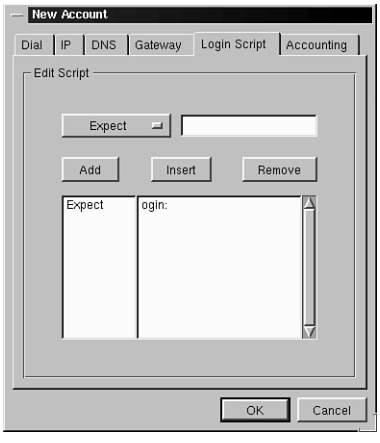
The kppp client's DNS Servers dialog box is used to define the addresses of your ISP's Domain Name Service computers.



This is a critical step in configuring your PPP connection. Click in the blank field next to the Expect button (as shown in Figure 10.4), type the phrase **`ogin:`**, and click the Add button. This tells `kppp` to look for part of the phrase `login:` after it connects with your ISP's computer.

FIGURE 10.4

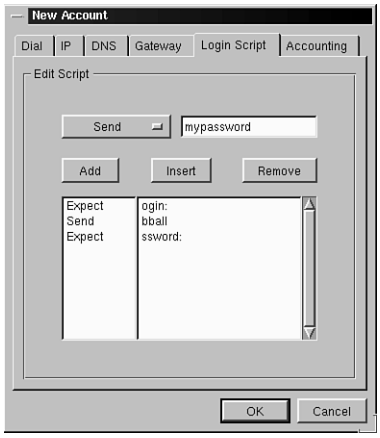
The kppp client's Login Script dialog box is used to define a series of expected phrases and responses to log you into your ISP's computer and start your PPP connection.



Next, click the Expect button, and select the Send item from the pop up menu (as shown in Figure 10.5). Type your username (assigned by your ISP), and click the Add button. This tells `kppp` to send your username when it detects the phrase `ogin:` during the connection process.

FIGURE 10.5

The kppp client sends your username and password according to expected phrases in its login script.

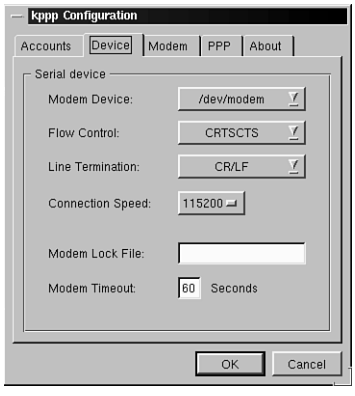


Next, again select the Expect item, type **`ssword:`** (to represent the phrase `password:` sent by your ISP's computer), and click the Add button. Finally, select the Send item, type your password (assigned by your ISP), and click the Add button. When you finish, click OK. You return to the `kppp` main Configuration dialog box. Click the Device tab to set the modem device you want `kppp` to use.

In the dialog box (as shown in Figure 10.6), click each pop-up menu to select the Modem Device, Flow Control, Line Termination, Connection Speed, Modem Lock File, and Modem Timeout. If you have a 56K or V.90 modem, the settings in Figure 10.6 work just fine. When you finish, click the Modem tab.

FIGURE 10.6

The kppp client's Device dialog box is used to define your modem, its speed, and other settings.

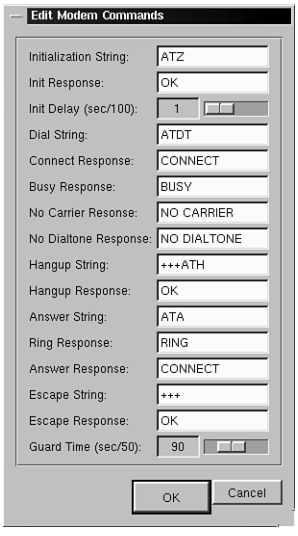


To see exactly what prompts are used by your ISP, follow the preceding steps in the section "Using `minicom` to Connect." Write down the prompts, and use them when you build your login script with `kppp`. This helps you later if you are having trouble and need to figure out what's going on during a connection.

In the Modem tab's dialog box, click the Modem Commands button to view the default modem commands used by `kppp`. If your modem requires any special settings, enter the proper commands in the Initialization String field as shown in Figure 10.7. When you finish, click the OK button.

FIGURE 10.7

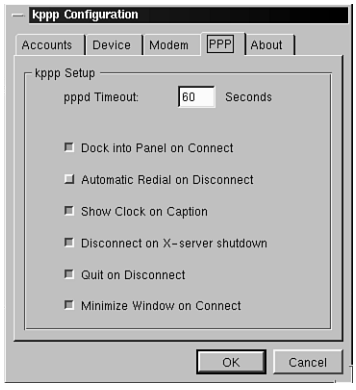
Configure your modem in the `kppp` *Edit Modem Commands dialog box by entering AT commands or response strings.*



To finish your `kppp` configuration, click the PPP tab to view the `kppp` Setup dialog box, as shown in Figure 10.8. Use the different settings in this dialog box to control how `kppp` acts after it starts or stops or when you stop your X11 session. For example, if you select Dock into Panel on Connect, a tiny modem icon with flashing red and green send and receive lights docks into the far right of your desktop's panel when you connect. When you finish, click OK. You're now done configuring `kppp`!

FIGURE 10.8

The kppp client's PPP dialog box is used to determine how kppp should act depending on where you are in your X11 session.

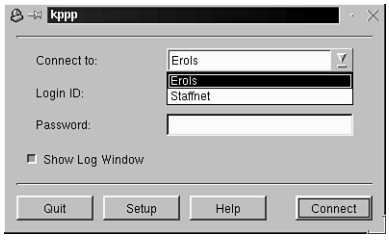


Starting and Stopping PPP with `kppp`

To start your PPP connection, select your ISP from the `kppp` drop-down menu, and then click the Connect button (as shown in Figure 10.9). If you select the Show Log Window, a window appears as `kppp` attempts the connection. This is a handy diagnostic tool you can use to watch the progress and conversation between `kppp` and your ISP's computer. When the PPP connection is made, `kppp` docks into your desktop's panel as a small modem icon. The `kppp` client also makes temporary *domain* and *name server* entries in your OpenLinux system's `/etc/resolv.conf` file.

FIGURE 10.9

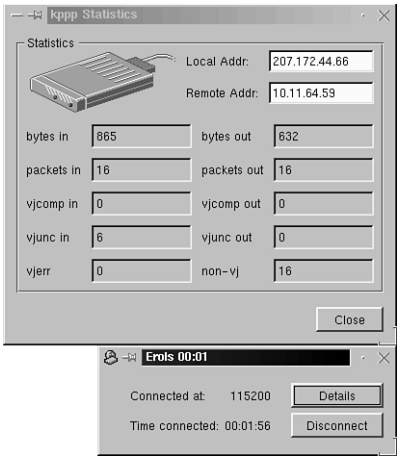
Click the Connect button in the kppp client's main dialog box to start a PPP connection.



To get information about your PPP connection, right-click the modem icon on your desktop's panel, and then click the Restore menu item. A small dialog box appears with the name of your ISP. To view details about your connection, click the Details button, and a large dialog box appears, as shown in Figure 10.10.

FIGURE 10.10

The kppp client features several dialog boxes with information about your PPP connection.



To shut down your PPP connection, either click the Disconnect button in the small dialog box or select Disconnect after right-clicking the `kppp` icon in your desktop's panel.

Configuring a PPP Connection with `xisp`

The `xisp` client included with OpenLinux is another easy-to-use graphical interface you can use to configure, start, and stop PPP connections. This section shows you how to configure `xisp` to work with an ISP. You must be running X11 to use `xisp`.

To start the `xisp` client type **`su -c "xisp&"`** and press Enter at the command line of an X11 terminal window. After entering the root operator password, the X-ISP dialog box appears, as shown in Figure 10.11.

FIGURE 10.11

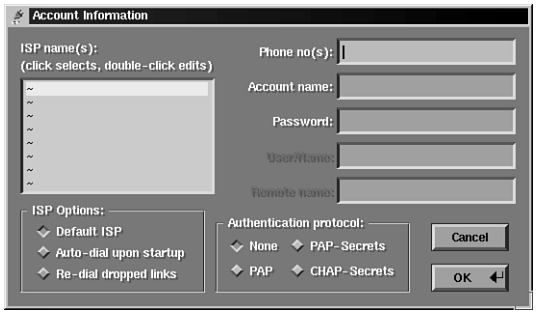
The `xisp` client can be used to set up, start up, and shut down PPP connections during X11 sessions.

Configuring a New `xisp` Account

Select the Options menu and click Account Information to start your configuration. The `xisp` Account Information dialog box appears (as shown in Figure 10.12). To define a new account, click a blank line under ISP name. A small dialog box appears. Type your ISP's name, and click OK. Enter the ISP's phone number, your account name, and your account's password. Note that your password is not echoed on the screen, so make sure to type it in correctly! Also, if you need any other options, such as password authentication, click the appropriate buttons. When you finish, click OK.

FIGURE 10.12

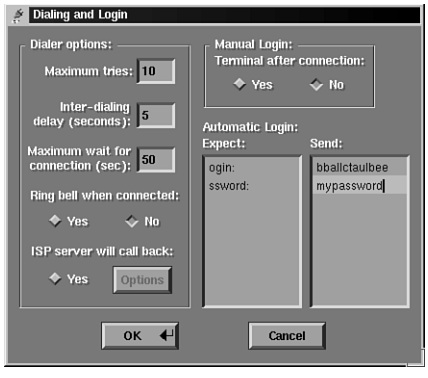
Use the `xisp` client's New Account dialog box to define a new PPP account.



Next, select the Options menu, and click the Dialing and Login menu item (as shown in Figure 10.11). The `xisp` Dialing and Login dialog box (similar to the `kppp` dialog box shown in Figure 10.5) appears. Enter the expected characters and responses for your ISP and select other desired options from the dialog box, as shown in Figure 10.13. Note that your password in the send column is echoed back to the screen (so make sure no one is looking over your shoulder)! When you finish, click the OK button.

FIGURE 10.13

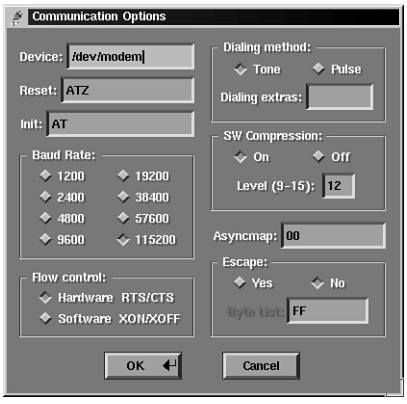
The `xisp` client automates PPP connections with login scripts similar to those for the `kppp` client.



Next, select the Options menu and click the Communications Options menu item (as shown in Figure 10.11). The Communications Options dialog box appears as shown in Figure 10.14. Select the appropriate modem device and baud rate. Most of other default settings can be used as is. When you finish, click the OK button.

FIGURE 10.14

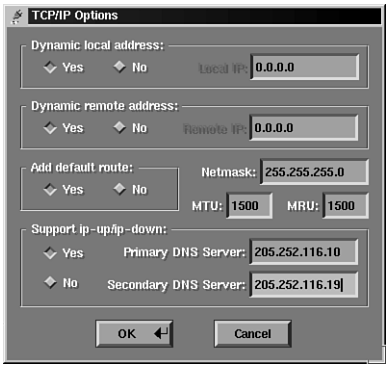
Select the appropriate communications options for your OpenLinux system when configuring a new account with the `xisp` *client.*



Now, select the Options menu again, and click the TCP/IP Options menu item (as shown in Figure 10.11). The TCP/IP Options dialog box appears as shown in Figure 10.15. If your ISP assigns IP addresses dynamically, simply click the Yes button for ip-if/up, and then type the primary and secondary DNS addresses for your ISP. When you finish, click the OK button. You're done!

FIGURE 10.15

The TCP/IP `xisp` *dialog box is used to define the addresses of your ISP's Domain Name Service computers.*



Although `xisp` is supposed to manipulate your system's `/etc/resolv.conf` file, it might not. You might have to put your ISP's DNS addresses in your `/etc/resolv.conf` before starting your connection. This information is absolutely necessary for Web browsing and other Internet activities.

Starting and Stopping PPP with `xisp`

To start your PPP connection, start `xisp`, and then click the Connect button. As `xisp` attempts to make the connection, the progress and status scroll by in the main `xisp` window (as shown in Figure 10.16). When you are logged in to the Internet, your IP address appears in the IP: field. The `xisp` client also keeps track of your time online and your connection speed.

FIGURE 10.16

Click the Connect button in the `xisp` client's main dialog box to start a PPP connection and Internet session.

To shut down your PPP connection, click the Disconnect button. If you need help with `xisp`, read its manual page, select the General Info menu item from its main dialog box, or see the README files under the `/usr/doc/xisp` directory.

Checking the Connection

You can diagnose, troubleshoot, or get more information about your PPP connection in a number of ways. You can use networking utility programs during your connection to test, time, and diagnose the `ppp0` interface. You can also examine system logs to look for any problems occurring during startup, connecting, and disconnecting.

This section introduces you to a few of these networking programs and shows you where to look in your system logs for more information.

Using the `ifconfig` Command

Although the `ifconfig` command, found under the `/sbin` directory, is generally used in network administration by the root operator to configure network interfaces (a skill not covered in this book; see the *Linux Network Administrators Guide*), you can use `ifconfig` to see the status of your PPP connection.

This command can also be helpful when you're running programs, such as newsreaders, which appear "frozen" but are actually sending and receiving data without displaying updates on your screen. To use `ifconfig`, just enter the following:

```
# /sbin/ifconfig
lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Bcast:127.255.255.255  Mask:255.0.0.0
          UP BROADCAST LOOPBACK RUNNING  MTU:3584  Metric:1
          RX packets:17257 errors:0 dropped:0 overruns:0
          TX packets:17257 errors:0 dropped:0 overruns:0

ppp0      Link encap:Point-Point Protocol
          inet addr:207.226.80.52  P-t-P:207.226.80.4
Mask:255.255.255.0
          UP POINTOPOINT RUNNING  MTU:1500  Metric:1
          RX packets:676 errors:0 dropped:0 overruns:0
          TX packets:545 errors:0 dropped:0 overruns:0
```

The command lists the current active network interfaces. Look at the `ppp0` listing, and you can see the number of bytes received and transmitted (in the form of packets) over your PPP interface. Calling the program intermittently from another console or terminal window under X shows you the progress of data being sent and received.

Using the `netstat` Command

The `netstat` command is the definitive command for checking your network activity, connections, routing tables, and other network messages and statistics. Try this command if you're interested in a flexible listing of what's going on. For example, you can try the following (and the sample output is abbreviated here):

```
# netstat
Active Internet connections (w/o servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp     1    0 localhost:1644          localhost:1322          CLOSE_WAIT
tcp     0    0 localhost:2579          localhost:6000          ESTABLISHED
...
tcp     0    0 serial52.staffnet.:4216 megan.staffnet.com:pop  ESTABLISHED
Active UNIX domain sockets (w/o servers)
Proto RefCnt Flags       Type       State         I-Node Path
unix  2      [ ]         STREAM     CONNECTED     417
...
unix  2      [ ]         STREAM                   419    /dev/log
unix  2      [ ]         STREAM     CONNECTED     1982
unix  2      [ ]         STREAM                   1983   /dev/log
```

The `netstat` command has more than a dozen different command-line options. See the `netstat` manual page for more information.

Using the `ping` Command

The `ping` command is useful for verifying that your ISP's IP addresses are valid and for testing the response times of your ISP's host servers. `Ping` sends test packets of data and measures the time it takes for the host to send back the information, as in the following example:

```
# ping staffnet.com
PING staffnet.com (207.226.80.1): 56 data bytes
64 bytes from 207.226.80.1: icmp_seq=0 ttl=254 time=176.9 ms
64 bytes from 207.226.80.1: icmp_seq=1 ttl=254 time=180.0 ms
64 bytes from 207.226.80.1: icmp_seq=2 ttl=254 time=170.0 ms
64 bytes from 207.226.80.1: icmp_seq=3 ttl=254 time=170.0 ms
64 bytes from 207.226.80.1: icmp_seq=4 ttl=254 time=170.0 ms
64 bytes from 207.226.80.1: icmp_seq=5 ttl=254 time=170.0 ms
64 bytes from 207.226.80.1: icmp_seq=6 ttl=254 time=169.7 ms
...

--- staffnet.com ping statistics ---
7 packets transmitted, 7 packets received, 0% packet loss
round-trip min/avg/max = 169.7/172.3/180.0 ms
```


As you can see, the `ping` command sends each packet and reports the amount of time (in thousandths of a second) it takes for the packet to be echoed back. By default, `ping` continues to send and receive information until you tell it to quit with Ctrl+C. Using the `-f`, or flood, option is not a nice thing to do to your ISP (or any other host computer for that matter), as it creates network overhead and unnecessary network traffic. If you want to test the connection for a short period of time, use the `ping` command's `-c` option, followed by a number, to have `ping` only send a specific number of packets, like this:

```
# ping -c 10 staffnet.com
```

Using the `route` Command

The `route` command, generally used to set up or delete networking routes for interfaces, can also be useful in showing you what is going on with your `ppp0` interface. You can try the following:

```
# /sbin/route
Kernel IP routing table
Destination     Gateway       Genmask         Flags Metric Ref   Use Iface
pm2.staffnet.co *             255.255.255.255 UH    0      0        0 ppp0
127.0.0.0       *             255.0.0.0       U     0      0        2 lo
default         pm2.staffnet.co 0.0.0.0       UG    0      0        3 ppp0
```

This listing (similar to the `netstat -r` command) shows that in addition to a normal loopback interface (127.0.0.0, defined in your `/etc/hosts` file), a `ppp0` interface is currently active. For more details about the `route` command, see its manual page.

Reading Your System Log

If you want to read in detail about what is going on while your scripts are executing, take a look through your system log for a file called `messages` under the `/var/log` directory. Try the following (as the root operator):

```
# less /var/log/messages
```

Look for the start of the `pppd` daemon in the `ppp-on` script. Notice that your dialer script uses the `chat` program, which does most of the work and then quits, followed by `pppd` getting and setting the network IP addresses, as follows:

```
...
Nov  5 16:29:49 localhost pppd[370]: pppd 2.2.0 started by root, uid 0
Nov  5 16:29:51 localhost chat[371]: timeout set to 3 seconds
Nov  5 16:29:51 localhost chat[371]: abort on (\nBUSY\r)
Nov  5 16:29:51 localhost chat[371]: abort on (\nNO ANSWER\r)
Nov  5 16:29:51 localhost chat[371]: abort on
➥(\nRINGING\r\n\r\nRINGING\r)
Nov  5 16:29:51 localhost chat[371]: send (rAT^M)
Nov  5 16:29:51 localhost chat[371]: expect (OK)
Nov  5 16:29:51 localhost chat[371]: rAT^M^M
Nov  5 16:29:51 localhost chat[371]: OK -- got it
Nov  5 16:29:51 localhost chat[371]: send (ATH0^M)
Nov  5 16:29:51 localhost chat[371]: timeout set to 30 seconds
Nov  5 16:29:51 localhost chat[371]: expect (OK)
Nov  5 16:29:51 localhost chat[371]: ^M
Nov  5 16:29:51 localhost chat[371]: ATH0^M^M
Nov  5 16:29:51 localhost chat[371]: OK -- got it
Nov  5 16:29:51 localhost chat[371]: send (ATDT659-9041^M)
Nov  5 16:29:51 localhost chat[371]: expect (CONNECT)
Nov  5 16:29:51 localhost chat[371]: ^M
Nov  5 16:30:10 localhost chat[371]: ATDT659-9041^M^M
Nov  5 16:30:10 localhost chat[371]: CONNECT -- got it
Nov  5 16:30:10 localhost chat[371]: send (^M)
Nov  5 16:30:10 localhost chat[371]: expect (ogin:)
Nov  5 16:30:10 localhost chat[371]:  57600^M
Nov  5 16:30:12 localhost chat[371]: ^M
Nov  5 16:30:12 localhost chat[371]: ^M
Nov  5 16:30:12 localhost chat[371]: Staffnet PM0 login: -- got it
Nov  5 16:30:12 localhost chat[371]: send (username^M)
Nov  5 16:30:12 localhost chat[371]: expect (assword:)
Nov  5 16:30:12 localhost chat[371]: username^M
Nov  5 16:30:12 localhost chat[371]: Password: -- got it
Nov  5 16:30:12 localhost chat[371]: send (password^M)
Nov  5 16:30:12 localhost pppd[370]: Serial connection established.
Nov  5 16:30:13 localhost pppd[370]: Using interface ppp0
Nov  5 16:30:13 localhost pppd[370]: Connect: ppp0 <--> /dev/modem
Nov  5 16:30:16 localhost pppd[370]: local  IP address 207.226.80.171
Nov  5 16:30:16 localhost pppd[370]: remote IP address 207.226.80.214
,,,
```

You can look at portions of your log to troubleshoot whether your modem is working or your ISP's modems are working. Hopefully, everything goes well, but if you have a hard time connecting or setting up your scripts, take the time to read the `chat` and `pppd` manual pages, along with the PPP-HOWTO and PPP-FAQ.

If you're still having trouble, make sure to read Robert Hart's PPP-HOWTO, along with Al Longyear's PPP-FAQ, which go into much more detail about setting up PPP connections. You can find a lot of handy hints about setting up, testing, and troubleshooting your connection. If security is a big issue for you, make sure to read these documents, too. You can also check with the `comp.os.linux.networking`, `comp.os.linux.setup`, or `comp.protocols.ppp` USENET newsgroups for specific information or tips on using PPP.

The next two hours show you how to set up your email and newsreader programs so you can send and receive email and read some favorite USENET newsgroups.

Summary

This hour you learned several ways to set up an Internet connection to your ISP using the PPP protocol. As you observed, OpenLinux comes with several connection and troubleshooting utilities that make getting connected to the Internet easier than ever before.

Q&A

Q My modem dials and connects to my ISP, but the connection dies almost immediately! What's going on?

A Make sure you have entered the proper log in sequence either in your `ppp-on` script, or in the appropriate dialog boxes for the `kppp` or `xisp` clients. Try manually connecting to your ISP with the `seyon` or `minicom` programs and note the prompt strings from your ISP's computer.

Q I manually connected with `minicom`, but after I log in to my ISP's computer and press Enter, I see strings of garbage characters echoed back!

A This is probably normal and shows that your ISP's computer has started PPP. Exit minicom without resetting your modem, and test your connection.

Q OK, I've established my connection. Now what?

A You should first try to `ping` a remote host computer, or attempt an FTP connection. For information about other Internet activities, see Hour 11, "Configuring Internet Email," Hour 12, "Configuring Internet News," or Hour 13, "Internet Downloading and Browsing."

Exercises

1. After establishing your PPP connection, try using other Internet utilities, such as the `whois` command, to get information about your ISP. At the command line of a terminal window, type `whois`, followed by the domain name of your ISP, and press Enter. What do you see?
2. Try using the `ping` command to see how fast packet information is returned to your computer. Test the speed with different host computers on the Internet and measure the difference.

HOUR 11

Configuring Internet Email

This hour shows you how to set up your OpenLinux system to handle electronic mail. You'll also explore various programs you can use to read and send mail, such as the `pine` mail program and Netscape Messenger.

First you'll learn to set up your system to send and receive mail, building on your experience in setting up and connecting to your ISP using PPP.

Setting Up and Getting Your Email

There's not really much to do to set up your system to send and receive mail, although configuring the main mail daemon, `sendmail`, is complex enough to be considered a black art, suitable only for UNIX wizards. You shouldn't be intimidated though, because you can use email right after you install OpenLinux.

NEW TERM I can't discuss all the details about UNIX mail in this hour, but you should understand how electronic mail works in general. The main programs involved in email are, in technical terms, *transport agents* and *user agents*. A transport agent is a program, usually a daemon, that sends mail files from one computer to the next automatically. A user agent is a program, also called a mail reader, that you use to manage messages. You'll learn how to use these programs in this hour.

After you install OpenLinux, you can find nearly all the programs you need to compose, send, and receive mail. The transport agent used for OpenLinux is `sendmail`, and it is configured and run automatically when you boot the operating system. As far as user agents and electronic mail utilities, you have a wide choice from at least nine (listed in Table 11.1).

TABLE 11.1 ELECTRONIC MAIL PROGRAMS FOR OPENLINUX

Name	*Description*
`biff`	Mail notification utility
`coolmail`	3D animated mail notification utility for X11
`elm`	Interactive mail program
`fastmail`	Bulk email program
`fetchmail`	Essential POP, IMAP, or ETRN mail retrieval program
`frm`, `nfrm`	Handy mailbox message list utilities
`mail`	Basic mail program
`messages`	Handy mailbox message counting utility
`ml`	Mail user agent for X11
`mush`	Shell for electronic mail
`mutt`	Mutt mail user agent
Netscape Messenger	Mail user agent component of Netscape Communicator `newmail`, `wnewmail`Mail notification utilities
`pine`	Program for Internet News and Email
`printmail`	Format utility to prepare mail for printing
`procmail`	Recipe-based mail processor
`readmsg`	Handy mail message extractionutility
`xbiff`	Mail notification utility for X11
`xfmail`	Mail user agent for X11
`xmailbox`	Mail notification utility for X11
`xmh`	Mail user agent for X11

Because you're probably connecting to the Internet with a PPP connection, the general approach to handling mail outlined in this hour is to do the following:

1. Log in and establish a PPP connection.
2. Retrieve mail using a retrieval utility or user agent.
3. Disconnect (or stay connected for a few quick replies).

This is a similar approach to other ways of handling mail. If you've experimented with free email dial-in account programs (such as Juno) for other operating systems, you know the general approach is to minimize connect time by composing and replying to mail offline, then connecting, sending and retrieving mail, and followed by logging off.

If you want details about Linux mail handling along with pointers to other sources of information, read Guylhem Aznar's Mail-HOWTO under the `/usr/doc/HOWTO` directory.

Retrieving Your Email with `fetchmail`

By now you're probably wondering how to get your email from your ISP. If you recall from the preceding hour, you need the IP address or name of your ISP's mail server. To get your mail, you need `fetchmail`, which can be found in the `/usr/bin` directory. The `fetchmail` program was written by Eric S. Raymond, an outstanding programmer, outspoken proponent of Open Source software, and all-around good guy (who wants to be known by his initials, *esr*).

NEW TERM This program has many features, including a *daemon* mode, or background mode, that periodically checks to see if you have mail while you're connected to your ISP. The `fetchmail` program can recognize and retrieve mail using all standard Internet mail-retrieval protocols, such as the following:

- POP2
- POP3
- RPOP
- APOP
- KPOP
- CompuServe POP3 with RPA
- SDPS
- IMAP
- ESMTP ETRN

To retrieve electronic mail, you need to know what protocol your ISP uses (most ISPs support POP3, APOP, or IMAP), along with your username and password on the mail server.

Put all this information together, connect to your ISP, and then grab all your waiting email with the `fetchmail` command. Include the `-p` option, followed by the type of protocol used, followed by the name of your ISP's mail server, and ending with the `-u` option and your username, like this:

```
# fetchmail -p POP3 pop.erols.com -u bball
Enter password for bball@pop.erols.com:
2 messages for bball at pop.erols.com (3524 octets).
reading message 1 of 2 (2335 octets) .. flushed
reading message 2 of 2 (1189 octets) . flushed
You have new mail in /var/spool/mail/bball
```

After you press Enter, `fetchmail` prompts for your password (so you can gain access to your ISP's mail server), then retrieves your mail, and flushes (or deletes) your mail from your ISP's mail server. If you want to keep copies of your mail on your ISP's mail server (not recommended), include the `-k` (keep) option on the command line.

Unfortunately, the version of `fetchmail` (4.0.7) included with OpenLinux 1.3 is sadly out of date. The current version at the time of this writing is 4.7.4 and includes numerous improvements. To get a newer version, browse to `ftp://metalab.unc.edu/pub/Linux/system/mail/pop`. To get the latest version, browse to `http://www.tuxedo.org/~esr/fetchmail`. You can find `.rpm` and `.tgz` versions at both sites.

To make retrieving email easier, `fetchmail` uses the contents of a file called `.fetchmailrc` you can create in your home directory. In fact, if you use the `—fetchmailrc` option, followed by the name of a different file, you can easily retrieve mail from different accounts or ISPs. The contents of a `.fetchmailrc` file are spelled out in detail in the `fetchmail` man page but generally consist of the following:

`poll` *`mailserver`* `protocol` *`POP3`* `username` *`yourusername`* `password` *`yourpassword`*

Use your favorite text editor to create your own `.fetchmailrc`, and replace *`mailserver`* with the name of your ISP's mailserver (such as `pop.erols.com`), *`POP3`* with your ISP's mail server protocol, *`yourusername`* with your username, and *`yourpassword`* with your password. Save the file, exit your editor, and then retrieve your mail, like so:

```
# fetchmail
```

If you want `fetchmail` to periodically check for waiting mail (say, every five minutes), use its daemon, followed by the number of seconds to specify the interval between checks. When you use this mode with the `-d` option, `fetchmail` runs as a background process. Start the command as follows:

```
# fetchmail -d 300
```

`fetchmail` also has a nifty option, `-c`, which merely checks to see if you have mail waiting and reports the number of messages, along with the size. For example:

```
# fetchmail -c
2 messages for bball at pop.erols.com (3435 octets).
```

By default, your mail goes into a single file with your username under the `/var/spool/mail` directory.

Remember: The `fetchmail` program is designed to work only one way; it retrieves your mail from your ISP's mail server and then tells your ISP's mail server to delete (or keep) your mail after messages are sent. Now that you've retrieved your mail, how do you send, read, or reply to messages? This is where user agents, or mail reading programs, come in.

If you get an error when retrieving mail, make sure that the `sendmail` daemon has started. This service, listed as the Mail Transfer Agent under the `lisa` command's Configure daemon/server autostart menu, ensures proper receipt and delivery of mail (in addition to mail forwarding).

Sending Mail with Mail Programs

This section introduces you to three basic mail programs you can use under Linux. The explanations start with one of the oldest, the `mail` program, and then follow with two screen-oriented programs, `elm` and `pine`.

Using the `mail` Program

The `mail` program, found under the `/bin` directory, is the simplest mail program you can use. It is not screen-oriented, and works on a line-by-line basis with single-letter commands. However, this program is easy to use to create and send messages. For example, to create a quick message, call `mail` with an email address on the command line like this:

```
# mail tball@mcp.com
Subject: Howzit going?
Hope everything is OK with you.
Just wanted to drop a quick line!
.
EOT
```

The `mail` program responds by asking for a Subject: line. Enter your message subject, and then press Enter. Next, type each line of text in the body of your message. When you finish, put a period (`.`) on a line by itself, and press Enter. The `mail` program sends the message.

Retrieving your messages is easy. After you connect to your ISP and retrieve your mail using `fetchmail`, type `mail` on the command line, for example:

```
# mail
Mail version 8.1 6/6/93.  Type ? for help.
"/var/spool/mail/bball": 5 messages 1 unread
    1 MAILER-DAEMON@staffn  Thu Jan  7 18:51  12/510
➥"DON'T DELETE THIS MES"
    2 majordomo@rim.calder  Sun Nov  8 11:26  54/2067
➥"Welcome to caldera-us"
    3 majordomo@rim.calder  Sun Nov  8 11:26  25/982
➥"Majordomo results: Re"
    4 bball@staffnet.com    Thu Jan  7 18:23  69/2805
➥"Welcome to caldera-us"
>U  5 bball@staffnet.com    Thu Jan  7 18:23  40/1658  "test"
&
```

The `mail` program retrieves your mail from the `/var/spool/mail` directory, prints its version, lists information about each message, and presents the ampersand (`&`) as a prompt. Note that a right angle bracket (`>`) precedes the current message. The basic mail commands are as follows:

- `t`—Type, or list, the current message
- `n`—Go to the next message and list it
- `+`—Move to the next message and list it
- `-`—Move backwards to the previous message and list it
- `h`—Reprint list of messages (after listing a message)
- `d`—Delete the current message
- `R`—Reply to sender
- `r`—Reply to sender and all recipients
- `q`—Quit, saving messages in the default mailbox, `mbox`
- `x`—Quit, and don’t save messages in `mbox`

One handy way to send a long message quickly is to use the command-line redirection operator of your shell. For example, if you compose a long message in your favorite text editor, you can send the message with the following:

```
# mail -s "How is it going?" myfriend@somewhere.com < mymessage.txt
```

Using this approach, the `mail` program creates a message with a subject you specify with the `-s` option (note that you must enclose the subject lines that contain spaces between quote marks) and then puts the file `mymessage.txt` into the body of the message. Be careful, though, because the message is sent right away without asking you if you really want to send it.

There are many different ways to use the `mail` program. You might find it useful. See the `mail` manual page for more information. Although using `mail` can be quick and convenient, the next two mail programs are a lot more interactive and offer features most people have become accustomed to when they send and receive mail.

Configuring and Using the `elm` Mail Program

The `elm` program, more than 10 years old, was originally developed by Dave Taylor and is now under cooperative development by a team of more than 40 programmers known as The Elm Development Group. This program features an interactive screen and can be used from the console or the command line of an X11 terminal window.

Unlike `pine`, `elm` must be started in a window with at least 14 rows, or it complains and quits.

When you first start `elm`, you're asked if you want to create `elm`'s default mail folder, `Mail`:

```
# elm

Notice:
This version of ELM requires the use of a .elm directory in your home
directory to store your elmrc and alias files. Shall I create the
directory .elm for you and set it up (y/n/q)?
```

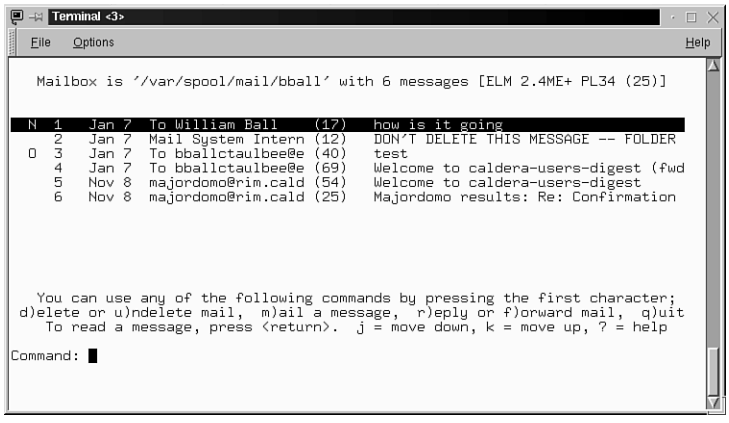
Press the `Y` key, and press Enter. `elm` has features similar to `mail` and `pine` (discussed in the next section). For example, you can, as in `mail`, send a message from the command line using the `mail` command example you saw earlier, for example:

```
# elm -s "How is it going?" bball@staffnet.com < author.msg
Sending mail...
Mail to bball@staffnet.com
Mail sent!
```

After you retrieve your mail, `elm` reads your messages and displays your them as shown in Figure 11.1

FIGURE 11.1

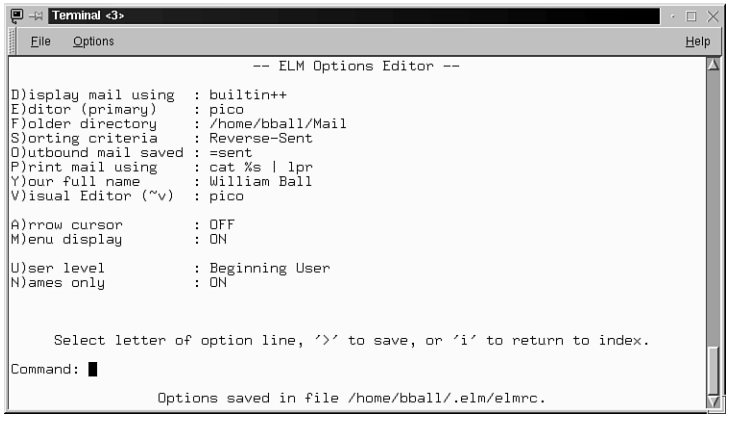
The `elm` mail program displays messages in a list.


Terminal <3>
File Options Help
Mailbox is '/var/spool/mail/bball' with 6 messages [ELM 2.4ME+ PL34 (25)]
N 1 Jan 7 To William Ball (17) how is it going
2 Jan 7 Mail System Intern (12) DON'T DELETE THIS MESSAGE -- FOLDER
O 3 Jan 7 To bballctaulbee@e (40) test
4 Jan 7 To bballctaulbee@e (69) Welcome to caldera-users-digest (fwd
5 Nov 8 majordomo@rim.cald (54) Welcome to caldera-users-digest
6 Nov 8 majordomo@rim.cald (25) Majordomo results: Re: Confirmation
You can use any of the following commands by pressing the first character;
d)elete or u)ndelete mail, m)ail a message, r)eply or f)orward mail, q)uit
To read a message, press <return>. j = move down, k = move up, ? = help
Command:

You can use `elm` to delete, forward, save, or compose messages. Customize some of its features by typing an **o** (for options) while in elm's main display (as shown in Figure 11.2). Type a letter, then type a new value for features such as the default editor (used when you compose or reply to messages), and press Enter. These custom features are saved in an `elmrc` file under the `.elm` folder in your home directory when you press the < key.

FIGURE 11.2

The `elm` setup dialog is used to set various options.


Terminal <3>
File Options Help
-- ELM Options Editor --
D)isplay mail using : builtin++
E)ditor (primary) : pico
F)older directory : /home/bball/Mail
S)orting criteria : Reverse-Sent
O)utbound mail saved : =sent
P)rint mail using : cat %s | lpr
Y)our full name : William Ball
V)isual Editor (~v) : pico
A)rrow cursor : OFF
M)enu display : ON
U)ser level : Beginning User
N)ames only : ON
Select letter of option line, '>' to save, or 'i' to return to index.
Command:
Options saved in file /home/bball/.elm/elmrc.

Make sure to read the manual page for `elm` before you start using it. You can also find documentation under the `/usr/doc/elm` directory. If you want more information about `elm`, you can also check the following:

`http://www.myxa.com/elm.html`

Configuring and Using the `pine` Mail Program

The `pine` (Pine Is No longer Elm) mail program, which you can find under the `/usr/bin` directory, was developed by the University of Washington as an interactive mail and news reader. This means that not only can you use `pine` for sending or reading your mail, but you can also use it to read Usenet newsgroups. Usenet and different news readers are discussed in the next hour, "Configuring Internet News." This section focuses on configuring and using `pine` for electronic mail.

The `pine` program also comes with an extremely easy-to-use editor called `pico`, which might easily become your favorite Linux text editor because it can be used with any other program and not just `pine`. See Hour 14, "Text Processing," for more details about the `pico` editor.

The `pine` program is easy to set up and use. Most of the work is done for you automatically when you first start the program. The first time you use this program, it reports the following:

```
# pine
Creating subdirectory "/home/bball/mail" where Pine will store
its mail folders.
```

The `pine` program starts up and creates a directory called `mail` along with a `.pinerc` configuration file in your home directory. You see an initial greeting screen (as shown in Figure 11.3).

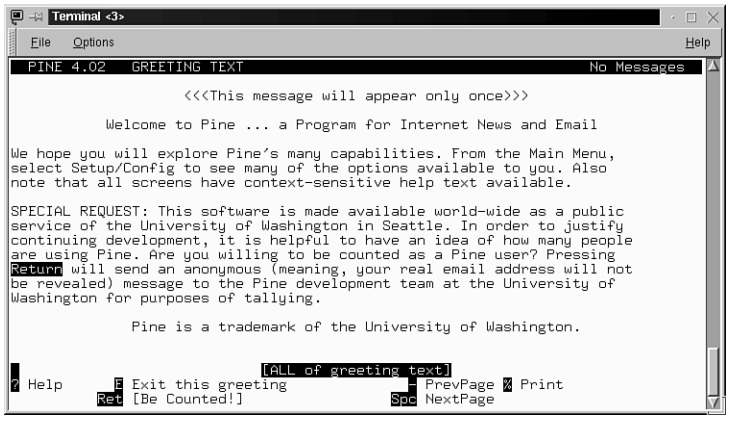

Terminal <3>
File Options Help
PINE 4.02 GREETING TEXT No Messages
<<<This message will appear only once>>>
Welcome to Pine ... a Program for Internet News and Email
We hope you will explore Pine's many capabilities. From the Main Menu, select Setup/Config to see many of the options available to you. Also note that all screens have context-sensitive help text available.
SPECIAL REQUEST: This software is made available world-wide as a public service of the University of Washington in Seattle. In order to justify continuing development, it is helpful to have an idea of how many people are using Pine. Are you willing to be counted as a Pine user? Pressing Return will send an anonymous (meaning, your real email address will not be revealed) message to the Pine development team at the University of Washington for purposes of tallying.
Pine is a trademark of the University of Washington.
[ALL of greeting text]
? Help E Exit this greeting - PrevPage % Print
Ret [Be Counted!] Spc NextPage

FIGURE 11.3

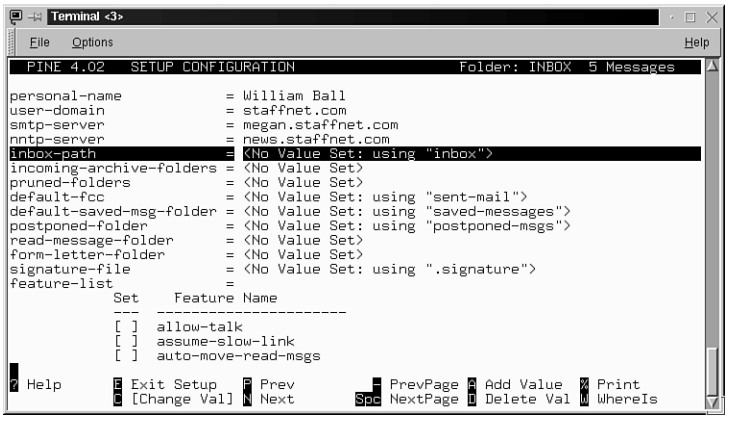
The `pine` mail program works with your console or through an X11 terminal window.

Before you start composing or sending mail, configure `pine` to recognize your username, your ISP's mail server, and, as you'll see later, your ISP's news server. Although you can compose mail and use `pine`'s `postpone` feature to save your composed messages, you can't send mail until you tell `pine` who you are or the name of your ISP's mail server.

To do this, first start `pine`, and then type an **s** and then a **c** to get to `pine`'s configuration screen (see Figure 11.4).

FIGURE 11.4

Specify the personal name, user domain, smtp server, and nntp server in the `pine` mailer configuration screen.

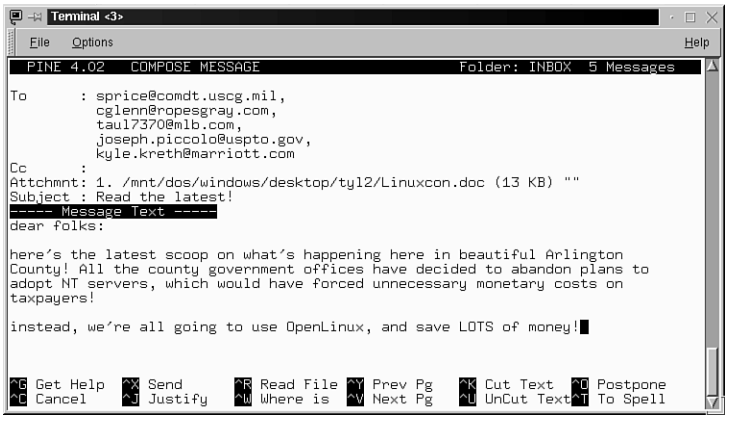


Enter your personal name, the domain of your ISP, the name of your ISP's mail server, and if you know it, the name of your ISP's news server. Then type an **e**, and pine asks if you want to save the changes. Your configuration is then saved in the `.pinerc` file in your home directory. Although you can edit this file in your favorite text editor, using `pine` is a lot easier.

To compose a message, press the **c** key, and you're in `pine`'s compose mode (see Figure 11.5).

FIGURE 11.5

Composing a mail message with file attachments to multiple recipients in the `pine` compose mode.


Terminal <3>
File Options Help
PINE 4.02 COMPOSE MESSAGE Folder: INBOX 5 Messages
To : sprice@comdt.uscg.mil,
cglenn@ropesgray.com,
taul7370@mlb.com,
joseph.piccolo@uspto.gov,
kyle.kreth@marriott.com
Cc :
Attchmnt: 1. /mnt/dos/windows/desktop/tyl2/Linuxcon.doc (13 KB) ""
Subject : Read the latest!
----- Message Text -----
dear folks:
here's the latest scoop on what's happening here in beautiful Arlington County! All the county government offices have decided to abandon plans to adopt NT servers, which would have forced unnecessary monetary costs on taxpayers!
instead, we're all going to use OpenLinux, and save LOTS of money!
^G Get Help ^X Send ^R Read File ^Y Prev Pg ^K Cut Text ^O Postpone
^C Cancel ^J Justify ^W Where is ^V Next Pg ^U UnCut Text ^T To Spell

You can specify multiple recipients to your message by typing a comma between names. You can also send file attachments by typing the name of the file in the Attchmnt: field (if it is in your home directory) or the complete path of your file (if it is somewhere else on your file system).

As you compose your message, use your cursor keys to move around the text. There are a number of editing keys you can use to change your text. Lines of text can also be deleted or undeleted for cutting and pasting. These keys, listed in table 11.2, correspond with the `pico` editor.

TABLE 11.2 PINE MESSAGE COMPOSITION EDITING COMMANDS

Action	*Keystroke*
Back one character	Ctrl+B
Backspace	Ctrl+H
Cancel message	Ctrl+C
Delete character	Ctrl+D
Delete line	Ctrl+K
Down one line	Ctrl+N
Forward one character	Ctrl+F
Help on editing	Ctrl+H
Insert text from file	Ctrl+R
Justify paragraph	Ctrl+J
Beginning of line	Ctrl+A
End of line	Ctrl+E
Next word	Ctrl+@
Page down	Ctrl+V
Page up	Ctrl+Y
Postpone (save) message	Ctrl+O
Spellcheck	Ctrl+T
Up one line	Ctrl+P
Word search	Ctrl+W

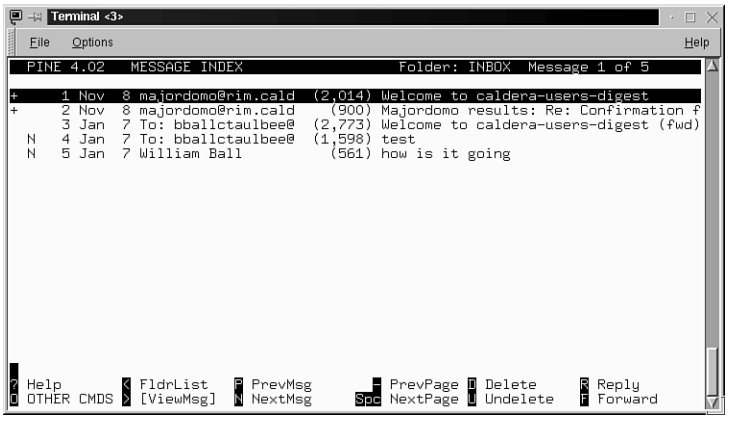
When you finish composing your message, send the message immediately by using Ctrl+X, or postpone the message by using Ctrl+O. Using this approach, you can create or reply to messages when you're not connected to your ISP and send them later.

When you retrieve your mail, `pine` looks in the `/var/spool/mail` directory, and then extracts the messages from your mail file and puts them into the default folder, `INBOX`, in the directory named `mail` in your home directory. You can also create other folders and save and delete messages in different folders to organize your mail. Of course, you can also use the `procmail` approach discussed in the section "Configuring `procmail` and Writing Recipes to Fight Spam" later in this chapter to automate some of this process for you.

The folder index of your messages is displayed in a list, and you can select messages by scrolling up and down with the cursor keys (see Figure 11.6). From the main list of messages, you can delete, undelete, save, read, and export messages to your directory. To read a message, just hit the Enter key.

FIGURE 11.6

You can select messages through the message list of a `pine` mail folder.



The `pine` program has a number of command-line options and other features, such as built-in help, which you access with the question mark (`?`) from the `pine` main menu.

Configuring and Using Netscape Messenger for Email

Netscape Messenger, a component of the Netscape Communicator suite of Internet clients, is a graphical electronic mail client for the X Window System. You can start this program from the Communicator menu in the Netscape Navigator window by clicking the Messenger button on Netscape's component bar. You can also start it through the use of the `-mail` option with the `netscape` command like this:

```
# netscape -mail &
```

When the client launches (as shown in Figure 11.7), select the Edit menu, and then click the Preferences menu item. When the Preferences dialog box appears, click the Mail & Groups item, and then click the Identity list item. Type in your name and email address, as shown in Figure 11.8.

FIGURE 11.7

Netscape Messenger is an easy-to-use interface to electronic mail in X11.

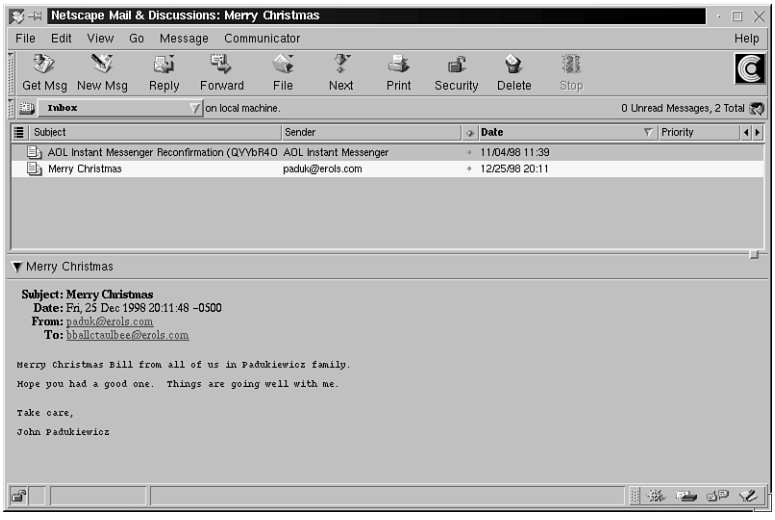
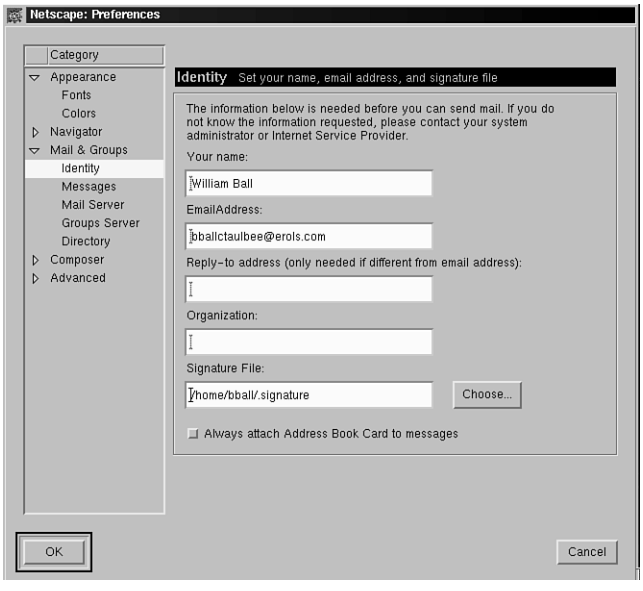

Netscape Mail & Discussions: Merry Christmas
File Edit View Go Message Communicator Help
Get Msg New Msg Reply Forward File Next Print Security Delete Stop
Inbox on local machine. 0 Unread Messages, 2 Total
Subject Sender Date Priority
AOL Instant Messenger Reconfirmation (QYYbR4O AOL Instant Messenger 11/04/98 11:39
Merry Christmas paduk@erols.com 12/25/98 20:11
Merry Christmas
Subject: Merry Christmas
Date: Fri, 25 Dec 1998 20:11:48 -0500
From: paduk@erols.com
To: bballctaulbee@erols.com
Merry Christmas Bill from all of us in Padukiewicz family.
Hope you had a good one. Things are going well with me.
Take care,
John Padukiewicz

FIGURE 11.8

Enter your name and email address, along with any other desired information (such as your organization), in the Messenger Identity dialog box.

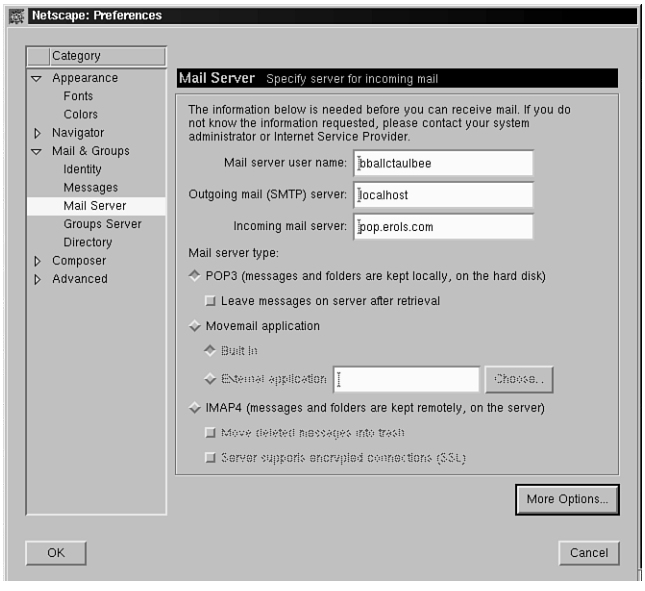


By default, Netscape Messenger sends the text of your email message formatted in HTML. This is okay if you're sending mail to another Netscape user but is a messy way to communicate with others who use `mail`, `elm`, or `pine`. Turn off the HTML message format by clicking the Messages list item under Mail & Groups and then deselecting the HTML messages push button under the Message Properties section of the Messages dialog box.

Next, click the Mail Server list item. This dialog box (shown in Figure 11.9) is used to set several critical items, such as server names and your ISP's mail retrieval protocol. Type your username (usually the name you use to log in to your ISP), and then type the name of your ISP's mail server in the Incoming mail server field (leave the outgoing server entry set to localhost). Next, click to select the type of mail server protocol used by your ISP.

FIGURE 11.9

You can use the Messenger Mail Server preferences dialog box to set critical information needed to retrieve and send mail.



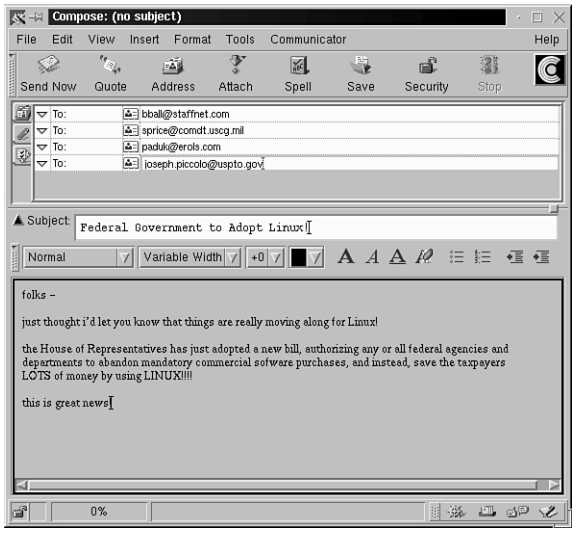
Click the More Options button to change other settings, such as the default mail folder or how often you want Messenger to check for waiting email.

When finished, click OK to save your changes. In the main Messenger window, click the Get Msg button (shown in Figure 11.7). Messenger asks for your password. Click the OK button to retrieve your messages. New messages appear in a list in the Messenger window. To read a message, click the desired message in the message list, and its text appears in the bottom half of the Messenger window.

At this point, you can use the various Messenger buttons to reply to, forward, save, print, or delete the message. To compose a new message, click the New Msg button in Messenger's menu bar. The Messenger Compose window appears, as shown in Figure 11.10.

FIGURE 11.10

Compose new messages, address multiple recipients, and attach Web pages or files through Messenger's Compose window.


Compose: (no subject)
File Edit View Insert Format Tools Communicator Help
Send Now Quote Address Attach Spell Save Security Stop
To: bball@staffnet.com
To: sprice@comdt.uscg.mil
To: paduk@erols.com
To: joseph.piccolo@uspto.gov
Subject: Federal Government to Adopt Linux!
Normal Variable Width +0
folks –
just thought i'd let you know that things are really moving along for Linux!
the House of Representatives has just adopted a new bill, authorizing any or all federal agencies and departments to abandon mandatory commercial sofware purchases, and instead, save the taxpayers LOTS of money by using LINUX!!!!
this is great news!
0%

Click in the To: field to enter a recipient. To enter multiple recipients, press Enter after typing in an email address. Next, click in the Subject: field, and enter a subject. If you want to send an attachment with the message, click the Attach button in the compose window's menu bar, or select the File menu and the Attach menu item. Click your mouse in the blank area of the Compose window (below the formatting bar), and type in a message. When you finish, you can save the message as a draft, spellcheck the message, or send the message by clicking on the Send Now button.

Subscribing to Mailing Lists

When you feel confident that your mail system is working, you might want to subscribe to a mailing list. Mailing lists are handled by automatic mail servers and work by relaying messages generated to all members of a mailing list. One smart way to subscribe to mailing lists is to sign up for a digest version in which the day's message traffic is condensed into a mailing once or twice a day.

You can find out more about mailing lists by browsing to the following:

```
http://www.lsoft.com/lists/listref.html
```

Chances are that you can find a mailing list (the preceding site enables you to search more than 21,000 of the 135,000 available lists at the time of this writing) of interest to you. Have fun!

To participate in discussions about OpenLinux using email and to exchange information with other OpenLinux users, send a message to **majordomo@rim.caldera.com** with the following line in the body of the message:

subscribe caldera-users youremailaddress@yourisp.com

An electronic mail message asks you to confirm your subscription. Reply to the message according to its directions. For more information about this service, send a message to **majordomo@rim.caldera.com** with the word **help** in the body of the message. You receive a reply with lots of details about using Caldera's mailing lists. For the digest version of Caldera's OpenLinux list, send a message to **majordomo@rim.caldera.com** with the following line in the body of the message:

subscribe caldera-users-digest youremailaddress@yourisp.com

Configuring `procmail` and Writing Recipes to Fight Spam

NEW TERM We're all used to getting junk mail or telemarketing calls. Day after day, we receive offers for credit cards, home equity loans, new long-distance service, or great deals on prime cuts of pot roast at the local food market. You can do something about unwanted postal mail, junk faxes, and telemarketing calls, but there's no current nationwide regulation regarding junk email, otherwise known as *SPAM* (not to be confused with the famous canned meat product).

Fortunately, many State's Attorney General offices around the United States are heeding the hue and cry against spammers, or junk emailers. Some states, such as California, now have civil penalties that are enforced against these bonehead spammers. This type of action is long overdue!

NEW TERM You can, however, use `procmail`, which is found under the `/usr/bin` directory, to filter your incoming mail. You need to create a directory, create several files, write a small script, and customize how your incoming mail is handled by writing short filters, or `procmail` recipes. It only takes you a minute or so to set up your system to organize incoming mail and dispose of junk mail.

The first step is to create a text file, called `.procmailrc`, in your home directory. Then, type in the following, specifying the name of your mail directory (if you use `pine`, the directory is `mail`), the location of the `.procmail` directory (which you'll soon create), and the name of your `procmail` filter file:

```
MAILDIR=$HOME/mail
PMDIR=$HOME/.procmail
INCLUDERC=$HOME/.procmail/rc.mailfilter
```

Save this file. Next, create a text file called `.forward` in your home directory. This file needs to contain the following line:

```
"¦IFS=' ' && exec /usr/bin/procmail -f- ¦¦ exit 75 #username"
```

This command line controls `procmail`, and you should use your username instead of "`username`." Now, make your `.forward` file world readable and your home directory world searchable with the `chmod` command. See the following example (making sure you're in your home directory):

```
# chmod 644 .forward
# chmod a+x .
```

You're almost done. Now, with the `mkdir` command, create a directory called `.procmail`, change directory into it, and create a text file called `rc.mailfilter`.

This file is to contain your `procmail` filters, or recipes. Although these recipes can be extremely complex (so complex, in fact, that you can write your own mail delivery service), this section presents simple recipes to get you started.

First, examine a sample message's mail headers (which contain the From:, To:, or Subject: lines). The British MG sports cars digest has the following subject line in each message:

```
Subject: mgs@autox.team.net digest #905 Mon Nov 17 10:09:07 MST 1997
```

Each digest message can contain almost 100,000 characters and is sent twice a day, so it is nice to have all these digests go into their own mail folder, which you can call `mgdigest`. To do this, you enter the following line in `rc.mailfilter`:

```
:0:
*^Subject:.*digest
mgdigest
```

This small recipe saves any incoming message with a subject line containing the word digest into a mail file called `mgdigest` in your mail program's mail directory (if you subscribe to other digests, such as Caldera's, you need to create separate recipes with more specific Subject line criteria). Note that you don't have to create this mail file yourself. It is created for you when you first retrieve mail and `procmail` finds a match. You can also use another recipe to have all mail files from your friends saved to a specific folder, for example:

```
:0:
*^From:.*aol.com
AOL
```

"Okay," you're asking, "but what about junk email?" Well, you know what you want to do with junk email—trash it! For Linux users, there's a special place to which you can send junk email: the old bit bucket, `/dev/null`. So if you get an unwanted message from a place like `hotlips4u.com`, you can send this type of garbage to the boneyard with the following:

```
:0:
^From:.*hotlips4u.com
/dev/null
```

Junk email is usually easily recognized because the message contains some form of clever subject line to interest you. Other clues include that you never requested the information in the message or that the sender, receiver, or reply-to sections of the message are forged (this is unethical and fraudulent behavior). Never reply to junk email, even if the mail contains a message such as "To never receive this message again, reply to bonehead@spammers.com with a message containing the word UNSUBSCRIBE in the body of text." This is a trap to verify your email address, and you could end up receiving even more junk mail!

The mail message isn't stored on your hard drive, and you don't have to bother with any mail from that address again. Using this approach is simplistic, however, and if you get a lot of junk mail, you might want to experiment with more complex recipes that can filter out everything except people with whom you want to exchange mail.

If you want to add some more features to your `procmail` service, read the `procmailrc` manual page. For a great selection of `procmail` recipes, see the `procmailex` manual page, which details numerous examples, ranging from simple to complex.

Want more information about `procmail`, writing `procmail` recipes, and filtering your mail? Look for Nancy McGough's Filtering Mail FAQ, which is posted regularly to the `comp.mail.misc`, `comp.mail.elm`, `comp.mail.pine`, and other newsgroups. Reading news from Usenet also happens to be the next hour's subject!

Summary

This hour introduced you to just several of the electronic mail programs available for OpenLinux. You can find these programs, and many others, available on this book's CD-ROM.

Q&A

Q When I try retrieving mail from my ISP, `fetchmail` reports an error! What's going on?

A Make sure that you specified the correct protocol with `fetchmail` to match your ISP's mail server protocol. Make sure that `sendmail` is running. Also, make sure that you use the latest version of `fetchmail`. For additional troubleshooting information, see the `fetchmail` FAQ under the `/usr/doc/fetchmail` directory.

Q I want to receive mail from a Microsoft Exchange server or through my CompuServe account. How do I do this?

A See the `fetchmail` FAQ under the `/usr/doc/fetchmail` directory. There are tips and tricks you can use to get your mail and traps to avoid during your OpenLinux PPP sessions.

Q I've set `fetchmail` to retrieve mail periodically from my ISP. How can I tell if mail has been received?

A There are many different mail notification programs included with OpenLinux. Some work with the console, whereas others only function during X11 sessions. See the `newmail` or `biff` man pages to get started. (Others are listed in the table at the beginning of this hour)

Q When I use `fetchmail`, it reports that the "connection failed" and "failed: temporary name server error." What's going on?

A You must first establish a PPP connection with your ISP. Also make sure that you correctly entered the name of your ISP's mail server in your `.fetchmail` rc file.

Exercises

1. Experiment with different mail programs, such as `xmh`, `mutt`, or `xfmail`. How are these programs different? What do you like or not like about these programs?
2. Create different `procmail` recipes to organize or filter your incoming mail. Save all junk email in a folder called `spam`, and then later sort through the mail and forward pertinent copies to the appropriate State Attorney General's office with a complaint.

HOUR 12

Configuring Internet News

This hour introduces you to Usenet news and shows you how to set up and use the `tin`, `slrn`, and K Desktop Environment's `krn` newsreader programs and the Discussions component of Netscape Communicator to read Usenet news during your PPP connection. Reading news can be an endless source of amusement, help, and even frustration (especially if the "signal-to-noise" ratio is low).

Usenet is an international network of computers around the world that share news and mail. Originally developed by Tom Truscott and James Ellis in 1979, Usenet was a collection of software that provided bulletin-board style communication between two university computer systems in North Carolina. In 10 years, Usenet grew to 10,000 computer systems, and although Usenet was originally started to support computer questions and answers, the number of different newsgroups, or discussion areas, grew to nearly 1,000 in the late 1980s.

Usenet newsgroups are organized in a hierarchy, usually by topic or type of discussion. For example, the Linux newsgroups are generally organized under the `alt.os`, `comp.os.linux`, or `linux` topics. Here is a partial list of Linux newsgroups of interest to U.S. readers; there are also many Linux newsgroups in other languages:

```
alt.os.linux.caldera
comp.os.linux.advocacy
comp.os.linux.announce
comp.os.linux.answers
comp.os.linux.hardware
comp.os.linux.misc
comp.os.linux.networking
comp.os.linux.portable
comp.os.linux.setup
comp.os.linux.x
```

This shows that most Linux subjects, such as setup, hardware, or X11, are organized under the topic of computers, operating systems, and Linux. You'll find many other subjects organized the same way. Although there's no guarantee you'll find the exact subject you're looking for, chances are you'll easily find a newsgroup discussing a subject you're interested in.

Today, there are dozens of different Usenet software transport programs and newsreaders and more than 50,000 different newsgroups.

All newsreaders offer these basic functions:

- Subscribing or unsubscribing to newsgroups
- Browsing messages and reading follow-up messages (threads)
- Directly mailing a reply to the author of a message
- Posting a follow-up message to a newsgroup message
- Saving the contents of a message (usually to a directory called `News` in your home directory)

The `tin` reader uses a newsgroup index file called `.newsrc` (whereas `slrn` uses a file named `.jnewsrc`), which is normally located in your home directory. These programs do not require the X Window System, so you can read news after connecting to the Internet through your Internet service provider (ISP). The `krn` newsreader, which requires X11, also uses an index file in your home directory but with a name beginning with `.newsrc-` followed by the name of your ISP's news server. You'll see how to configure `krn` later in this hour.

Although you can start both `tin` and `slrn` and tell the programs to retrieve a complete list of active newsgroups from your ISP's news server, you'll waste a lot of time while the programs retrieve the list (nearly 50,000 items at the time of this writing). Instead, create the `.newsrc` file with your favorite text editor and then enter the newsgroups you want to browse:

```
news.announce.newusers:
comp.os.linux.announce:
comp.os.linux.development.apps:
comp.os.linux.development.system:
comp.os.linux.hardware:
comp.os.linux.misc:
comp.os.linux.networking:
comp.os.linux.setup:
comp.os.linux.x:
comp.windows.x:
comp.windows.x.i386unix:
rec.autos.antique:
alt.humor.best-of-usenet:
rec.humor:
```

Not all ISPs provide access to all existing Usenet newsgroups. Many newsgroups, especially those with prurient content, may be excised or filtered out. If your ISP doesn't offer a specific newsgroup you're interested in, you can use your favorite Web browser (discussed in Hour 13, "Internet Downloading and Browsing") to read news through `http://www.dejanews.com`.

Notice that the list does not have to be in alphabetical order. You must have a colon following the newsgroup. If you type in a newsgroup not supported by your ISP, both `tin` and `slrn` will ignore the name, and both programs will display the list of newsgroups in the same order in which you typed them in the `.newsrc` file.

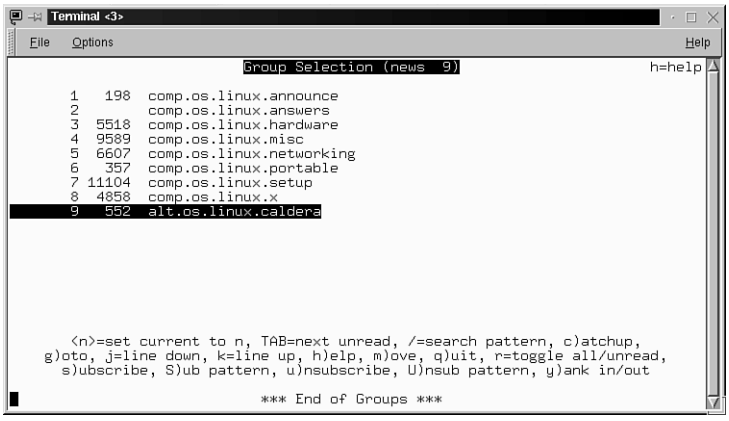
Developing your own list of newsgroups will speed up your newsreading considerably.

Reading Usenet News with the `tin` Newsreader

Iain Lea's newsreader, `tin`, which is found in the `/usr/bin` directory, is a full-screen newsreader that reads a list of newsgroups from the `.newsrc` in your home directory. The `tin` reader is easy to use (see Figure 12.1). You can navigate through its display with cursor keys, read messages with the Enter key, and reply with a single keystroke.

FIGURE 12.1

The `tin` newsreader displays newsgroups in a cursor-driven list.


Terminal <3>
File Options Help
Group Selection (news 9) h=help
1 198 comp.os.linux.announce
2 comp.os.linux.answers
3 5518 comp.os.linux.hardware
4 9589 comp.os.linux.misc
5 6607 comp.os.linux.networking
6 357 comp.os.linux.portable
7 11104 comp.os.linux.setup
8 4858 comp.os.linux.x
9 552 alt.os.linux.caldera
<n>=set current to n, TAB=next unread, /=search pattern, c)atchup,
g)oto, j=line down, k=line up, h)elp, m)ove, q)uit, r=toggle all/unread,
s)ubscribe, S)ub pattern, u)nsubscribe, U)nsub pattern, y)ank in/out
*** End of Groups ***

To read Usenet news with `tin`, you must tell the program the name of your ISP's NNTP, or news server. You should have received this information when you signed up for service. Once you have the name, you can tell `tin` the NNTP server name in at least two ways: by creating an `nntpserver` file under the `/etc` directory, which will only work for `tin`, or by creating an environment variable named `NNTPSERVER`, which will work for `tin` and `slrn`.

You do not have to create the `nntpserver` file or the `NNTPSERVER` variable if you use the `kppp` client to connect with your ISP. The `kppp` client will create temporary entries in the `hosts` file in your OpenLinux `/etc` directory.

To create the `nntpserver` file, first make sure you're logged in as root. Then, using a text editor (such as `pico`), create a file call `nntpserver` in the `/etc` directory. There's no special format to the file; all you have to do is type the name of the news server:

```
news.erols.com
```

Save the file and exit your editor. However, a better way to tell `tin` your ISP's news server is to define an environment variable named `NNTPSERVER`. Creating environment variables is discussed in Hour 6, "Using the Shell." One way to create the `NNTPSERVER` variable, if you always use the `bash` shell, is to log in as root and then edit a file named `profile` in the `/etc` directory. Enter the following into the file, and make sure the `NNTPSERVER` variable is placed in the export statement:

```
NNTPSERVER=news.erols.com
export NNTPSERVER
```

You can then read the variable into your environment with

```
# source /etc/profile
```

After reading the new variable from this file, you can check for the NNTPSERVER variable by piping the output of the env or printenv command through the fgrep command:

```
# printenv ¦ fgrep NNTPSERVER
NNTPSERVER=news.erols.com
```

You can also log out, log back in, and check again. Once defined, the NNTPSERVER variable will work for tin and slrn.

After you have defined your NNTPSERVER, connect with your ISP and call tin with this command line:

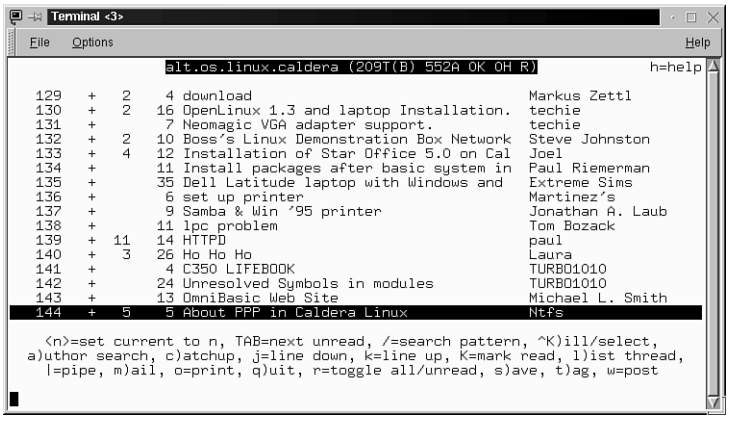
```
# tin -nqr
```

The -n option tells the tin program that you want it to only load newsgroups from your .newsrc file, whereas the q option specifies a quick start without checking for any new newsgroups. Finally, the r option tells tin to read your news remotely from your ISP's NNTP server. Once tin reads the groups and gathers any new news, it will display the newsgroups in a list (see Figure 12.1). Read a group's messages by using the Up or Down cursor keys to highlight a newsgroup name and then pressing Enter. The list of messages will appear, as shown in Figure 12.2.

If you don't want to use tin with its -r option but need to retrieve your news from a remote server, use the rtin version of tin with remote retrieval compiled in.

FIGURE 12.2

Listing a newsgroup's messages with the tin newsreader.


Terminal <3>
File Options Help
alt.os.linux.caldera (209T(B) 552A OK OH R) h=help
129 + 2 4 download Markus Zettl
130 + 2 16 OpenLinux 1.3 and laptop Installation. techie
131 + 7 Neomagic VGA adapter support. techie
132 + 2 10 Boss's Linux Demonstration Box Network Steve Johnston
133 + 4 12 Installation of Star Office 5.0 on Cal Joel
134 + 11 Install packages after basic system in Paul Riemerman
135 + 35 Dell Latitude laptop with Windows and Extreme Sims
136 + 6 set up printer Martinez's
137 + 9 Samba & Win '95 printer Jonathan A. Laub
138 + 11 lpc problem Tom Bozack
139 + 11 14 HTTPD paul
140 + 3 26 Ho Ho Ho Laura
141 + 4 C350 LIFEBOOK TURBO1010
142 + 24 Unresolved Symbols in modules TURBO1010
143 + 13 OmniBasic Web Site Michael L. Smith
144 + 5 5 About PPP in Caldera Linux Ntfs
<n>=set current to n, TAB=next unread, /=search pattern, ^K)ill/select,
a)uthor search, c)atchup, j=line down, k=line up, K=mark read, l)ist thread,
|=pipe, m)ail, o=print, q)uit, r=toggle all/unread, s)ave, t)ag, w=post

NEW TERM To read a message, scroll through the list (using the arrow keys) and press Enter. The message will appear. Although many OpenLinux Usenet readers like to *lurk*, or just read messages, you can reply directly by electronic mail to the person who posted the message by pressing the r key and composing a reply or follow-up to the message and post your comments by pressing the f key. Table 12.1 lists the main `tin` commands.

TABLE 12.1 COMMON `tin` COMMANDS

Action	*Command*
Backward search through articles	?
Follow up with post (when reading message)	f
Forward search through articles	/
List articles in highlighted group or read message	Enter
Post a new article to current group	W
Quit reading, quit listing, or quit tin	q
Read tin's help	h
Reply by email (when reading message)	r
Save current message to disk	s
Search for article author (in message list)	a
Subscribe to group (in group list)	s
Unsubscribe to group (in group list)	u

You can configure many `tin` settings, such as the default editor to use while posting or replying to messages. Edit the `tinrc` file under the `.tin` directory in your home directory. For other details about this newsreader, read the `tin` manual page.

Reading Usenet News with the `slrn` Newsreader

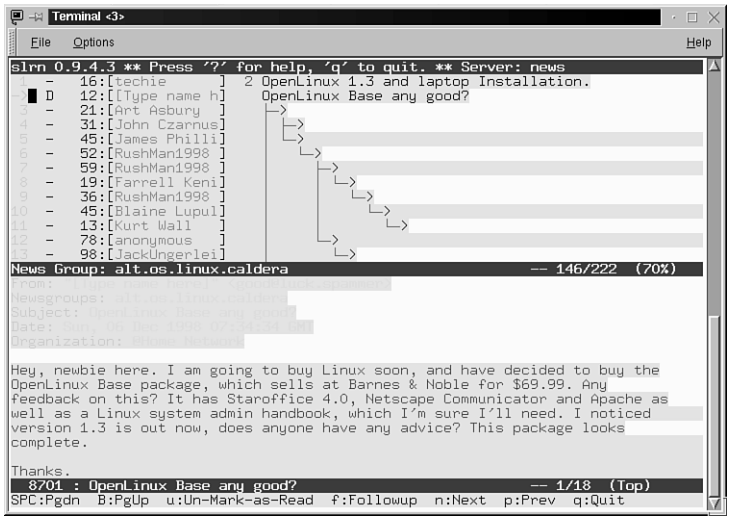
The `slrn` newsreader, by John E. Davis, in the `/usr/bin` directory, is a newsreader like `tin`. However, `slrn` has some nifty features not supported by the `tin` program:

- Message headers and messages are displayed at the same time.
- Extensive custom colors for different parts of the display and messages are available.
- Mouse-cursor–aware mode.
- Different NNTP servers can be specified on the command line.

Figure 12.3 shows the `slrn` screen.

FIGURE 12.3

The `slrn` newsreader features mouse-aware menus and split-screen viewing of messages and message contents.


Terminal <3>
File Options Help
slrn 0.9.4.3 ** Press '?' for help, 'q' to quit. ** Server: news
16:[techie] 2 OpenLinux 1.3 and laptop Installation.
D 12:[[Type name h] OpenLinux Base any good?
21:[Art Asbury]
31:[John Czarnus]
45:[James Philli]
52:[RushMan1998]
59:[RushMan1998]
19:[Farrell Keni]
36:[RushMan1998]
45:[Blaine Lupul]
13:[Kurt Wall]
78:[anonymous]
98:[JackUngerlei]
News Group: alt.os.linux.caldera -- 146/222 (70%)
Hey, newbie here. I am going to buy Linux soon, and have decided to buy the OpenLinux Base package, which sells at Barnes & Noble for $69.99. Any feedback on this? It has Staroffice 4.0, Netscape Communicator and Apache as well as a Linux system admin handbook, which I'm sure I'll need. I noticed version 1.3 is out now, does anyone have any advice? This package looks complete.
Thanks.
8701 : OpenLinux Base any good? -- 1/18 (Top)
SPC:Pgdn B:PgUp u:Un-Mark-as-Read f:Followup n:Next p:Prev q:Quit

The `slrn` program features a split display once you're reading messages in a newsgroup. You can also run `slrn` without specifying an `NNTPSERVER` variable with the `-h` command-line option:

```
# slrn -h news.staffnet.com
```

You'll also be able to browse quickly once you learn most of its keystroke commands, which are listed in Table 12.2.

Here's a tip on an undocumented feature you won't find in the `slrn` manual page: You can scroll up and down through messages by using the left or right mouse buttons of your mouse. Use `slrn` in a menu-driven mode by enabling mouse support. This is handy if you run `slrn` in an `xterm` or `rxvt` window under X11.

TABLE 12.2 COMMON `slrn` COMMANDS

Action	*Command*
Close current article	h
Follow-up post to current article	f
Forward copy of article by email	F
Go to next newsgroup	N
Mark all articles in group (or message list) as read	c
Post article to current group	p
Quit reading articles (in current group)	q
Quit `slrn` (from group list)	q
Read the next article in current group	n
Reply by email to current article	r
Save current article	o
Search for article (in message list)	/
Search for newsgroup name (in group list)	/
Subscribe to current group	s
Unsubscribe from current group	u

When you start `slrn`, the program looks under the `/var/lib/slrn` directory for a file called `slrn.rc`, which contains system-wide defaults for the program. You should copy this program as `.slrnrc` to your home directory and make your changes to this file. Although there are many different customizations you can perform, I cover a few here to get you started.

First, look for the `hostname`, `username`, `realname`, and `replyto` entries in the file. These entries look something like

```
%hostame "YOUR.HOSTNAME"
%set username "jd"
%set realname "John Doe"
%set replyto  "jd@somthing.com"
```

Change these entries to your username, your real name, and your email address:

```
hostname "erols.com"
set username "bball_NO_SPAM"
set realname "William Ball"
set replyto  "bballREMOVE_TO_REPLY@erols.com"
```

Note that you must remove the percent character (%) from the beginning of each of these lines to enable the options. I have also included the `_NO_SPAM` and `REMOVE_TO_REPLY` phrases in the `username` and `replyto` entries. These are to foil those insidious, nefarious, and insipid computer users who use "harvesting" software to extract email addresses and build spam lists from Usenet postings.

Using an invalid but easily correctable email address in newsgroup posting (such as `bball@_ALL_SPAMMERS_SHOULD_BE_HANGED_erols.com`) is one way to protect yourself against ending up in a junk emailer's spam list. See Hour 11, "Configuring Internet Email" to see how to automatically trash any incoming junk mail. Fortunately, a number of state governments in the United States, such as California, now have a $500 penalty for each piece of unwanted junk email. I hope other states will follow with similar legislation to help stem this electronic plague.

To enable mouse support, also look in your `.slrnrc` file for

```
% Enable xterm mouse support: 1 to enable, 0 to disable
  set mouse 0
```

Change `set mouse 0` to `set mouse 1` to enable menu- and mouse-driven modes in `slrn`. Yet another change you might want to make concerns how `slrn` displays messages and menus. Look for the color section of the `.slrnrc` file:

```
%-------------------------------------------------------
% Colors
%-------------------------------------------------------
color header_number     "black"         "white"
color header_name       "black"         "white"
color normal            "black"         "white"
color error             "red"           "white"
color status            "yellow"        "blue"
color group             "blue"          "white"
color article           "blue"          "white"
color cursor            "black"         "white"
color author            "blue"          "white"
color subject           "black"         "white"
color headers           "black"         "white"
color menu              "yellow"        "blue"
color menu_press        "blue"          "yellow"
color tree              "red"           "white"
color quotes            "red"           "white"
color thread_number     "blue"          "white"
color high_score        "red"           "white"
color signature         "red"           "white"
color description       "blue"          "white"
color tilde             "black"         "white"
```

These lines are in the format of display item, foreground color, and background color. According to the `slrn` manual page, these colors can be

```
black                gray
red                  brightred
green                brightgreen
brown                yellow
blue                 brightblue
magenta              brightmagenta
cyan                 brightcyan
lightgray            white
```

With a little bit of work, you can devise your own display.

Make your changes and then save the file. To use color during your newsreading sessions, start `slrn` with its `-C` or color option:

```
# slrn -C
```

When `slrn` starts, you'll have a color display and you can use your mouse to click menu items at the top of the screen, click a newsgroup to see lists of messages, or click a message in a message list to read the message.

The `slrn` newsreader is a flexible, customizable program that will work in black-and-white or color, with or without X11, and with the keyboard and your mouse.

Reading Usenet News with the `krn` Client

The `krn` client, included with KDE, is a graphical interface to reading Usenet news. You must run X11 in order to use the program (but you don't have to use KDE). If you use KDE for your X11 sessions, start `krn` by clicking the Application Starter button on your desktop's panel, selecting the Internet menu item, and then clicking the News client item. If you use some other window manager, you can start `krn` from the command line of a terminal window like this:

```
# krn &
```

After you press Enter, the `krn` main dialog will appear, as shown in Figure 12.4.

To configure `krn`, select the Options menu and then click Identity. The identity dialog will appear, as shown in Figure 12.5. Enter your real name, your email address (if you want, use the previous method for `slrn` to mask your address from spammers), and your Organization. (This field cannot be left empty, so you can use the default hyphen (-) entry.) This information will be used when you reply by email or follow up to a newsgroup posting. When finished, click OK to save your settings.

FIGURE 12.4

The krn newsreader features the familiar KDE graphical interface with a menu bar, buttons, and scrolling window.

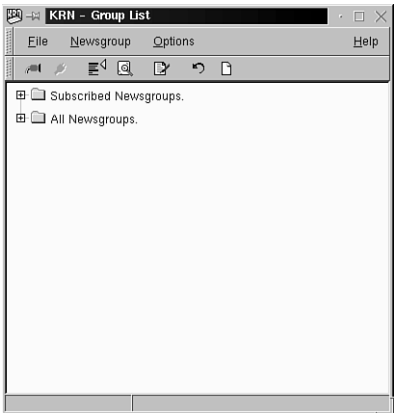
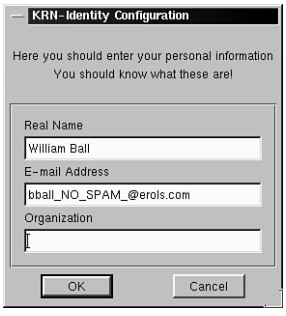


FIGURE 12.5

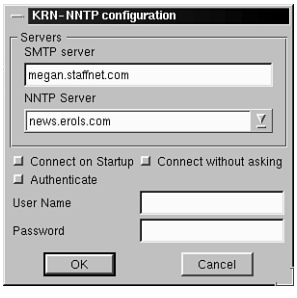
The krn identity dialog sets your username and email address.



Next, open the Options menu and click NNTP Options. In the dialog, shown in Figure 12.6, type the name of your ISP's mail server. Then, click in the NNTP Server field and type the name of your ISP's news server. If you want krn to connect to your ISP's news server as soon as it starts, select the appropriate option. If you need a username or password to access your ISP's news server, enter the correct username and password. These settings are used when krn connects to your news server and when you email a reply to a Usenet post. When finished, click OK to save your settings.

FIGURE 12.6

The krn NNTP options dialog is where you set access options for email and news service when newsreading.



You can set other options, such as how long you want to hold onto messages or how to print, through other menu items under the Options menu.

The main `krn` dialog features a row of buttons you can use to connect to or disconnect from your news server, list or find groups, subscribe or unsubscribe to groups, check for unread articles, or post new articles. To get an initial list of newsgroups from your ISP, click the Get list of active groups button (left of the Find group button with the small magnifying glass). `krn` will then ask whether it can connect to your ISP's news server. Click OK.

This operation might take several minutes as `krn` builds a list of newsgroups from your server. You'll see the size of the group file along with the message "Getting active list from server" at the bottom of `krn`'s window. When `krn` is finished, click the small plus sign (+) to the left of the All newsgroups folder.

The folder will open and list each top hierarchy of Usenet's newsgroups as another series of folders. Scroll through the list, and continue to click open folders until you reach a desired newsgroup, such as `alt.os.linux.caldera`. The newsgroup will appear, as shown in Figure 12.7.

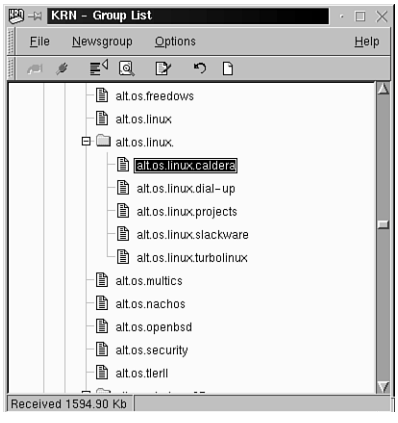


FIGURE 12.7

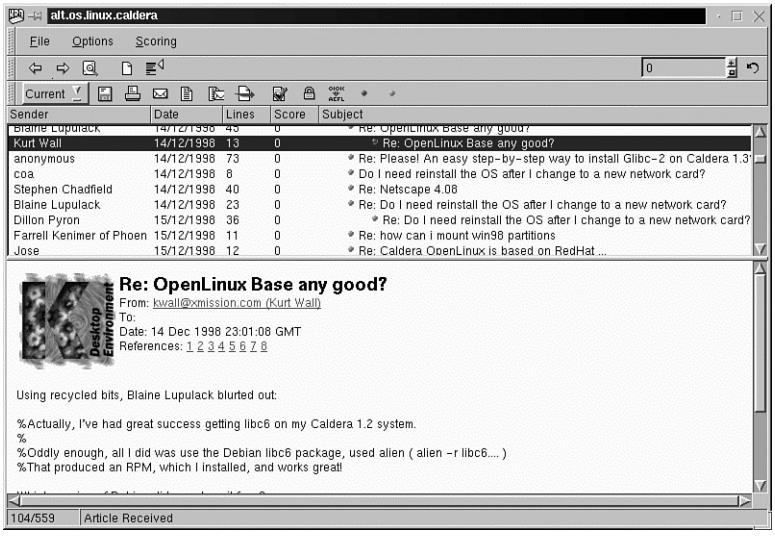
The `krn` client retrieves a list of newsgroups from your ISP and displays them in a hierarchy of folders.

Click and highlight a newsgroup name and then press the Subscribe button from `krn`'s menu bar. The small, blank document icon of the newsgroup will change to a document with a small quill attached. Repeat this step to build your list of subscribed newsgroups. The next time you start `krn`, your newsgroups will appear in the Subscribed folder.

To retrieve all available messages in the newsgroup, double-click the newsgroup name. The `krn` main newsreading window will appear after all unread messages have been retrieved and will show a list of articles (messages). If you click an article, its text will appear in the lower half of the newsreading window, as shown in Figure 12.8.

FIGURE 12.8

The `krn` *newsreading window features scroll bars and a point-and-click interface for reading, replying to, or following up on newsgroup articles.*


alt.os.linux.caldera
File Options Scoring
Current
Sender Date Lines Score Subject
Kurt Wall 14/12/1998 13 0 Re: OpenLinux Base any good?
anonymous 14/12/1998 73 0 Re: Please! An easy step-by-step way to install Glibc-2 on Caldera 1.3
coa 14/12/1998 8 0 Do I need reinstall the OS after I change to a new network card?
Stephen Chadfield 14/12/1998 40 0 Re: Netscape 4.08
Blaine Lupulack 14/12/1998 23 0 Re: Do I need reinstall the OS after I change to a new network card?
Dillon Pyron 15/12/1998 36 0 Re: Do I need reinstall the OS after I change to a new network card?
Farrell Kenimer of Phoen 15/12/1998 11 0 Re: how can i mount win98 partitions
Jose 15/12/1998 12 0 Re: Caldera OpenLinux is based on RedHat ...
Re: OpenLinux Base any good?
From: kwall@xmission.com (Kurt Wall)
To:
Date: 14 Dec 1998 23:01:08 GMT
References: 1 2 3 4 5 6 7 8
Using recycled bits, Blaine Lupulack blurted out:
%Actually, I've had great success getting libc6 on my Caldera 1.2 system.
%
%Oddly enough, all I did was use the Debian libc6 package, used alien (alien -r libc6....)
%That produced an RPM, which I installed, and works great!
104/559
Article Received

The numerous buttons in the window's menu bar let you

- Navigate through the newsgroup's articles
- Search for subjects
- Print
- Save to disk
- Reply to by email
- Follow up with a post
- Reply and follow up
- Forward by email
- Mark as read or unread

Click your mouse button on the Sender, Date, Lines, or Subject column headings to sort the article list.

Reading Usenet News with Netscape Discussions

Without a doubt, one of the most popular Internet software suites for OpenLinux is Netscape Communicator. You can use the Netscape Discussions component of Communicator to read Usenet news. If you're using KDE, click the Netscape icon in your desktop's panel to start Netscape, and then select the Communicator menu and click the Collabra Discussions menu item.

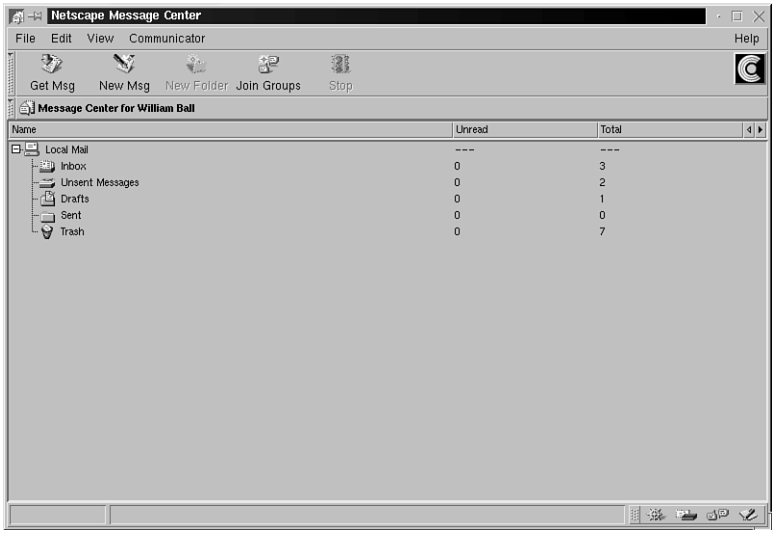
You can also start Netscape and jump right into Discussions from the command line of a terminal window by using the `netscape` command and the `-news` option:

```
# netscape -news &
```

After you press Enter, the Discussions window will appear. It looks similar to Netscape's Messenger, as shown in Figure 12.9.

FIGURE 12.9

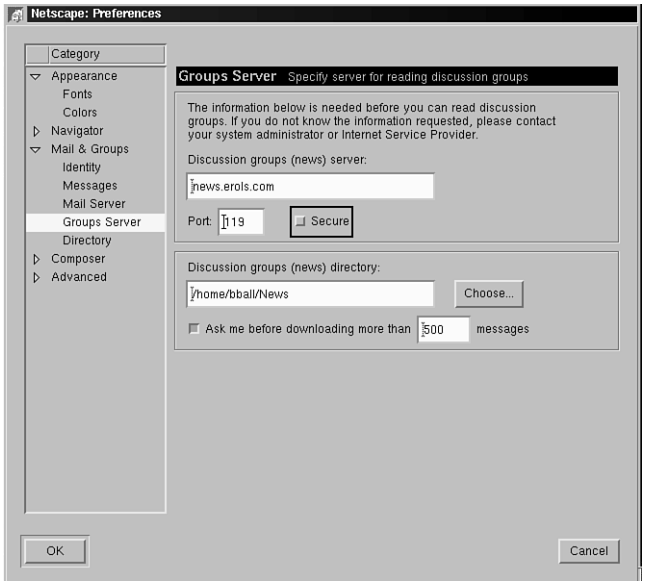
Before configuration to read Usenet news, Netscape Discussions looks very similar to Netscape's Messenger, or email window.


Netscape Message Center
File Edit View Communicator Help
Get Msg New Msg New Folder Join Groups Stop
Message Center for William Ball
Name Unread Total
Local Mail --- ---
Inbox 0 3
Unsent Messages 0 2
Drafts 0 1
Sent 0 0
Trash 0 7

To configure Discussions to read news, first Open the Preferences menu and then click Preferences. Next, in the dialog shown in Figure 12.10, click the Groups Server under the Mail and Groups list item. Type the name of your ISP's news server, and specify the directory you'd like to use to save newsgroups messages. When finished, click OK.

FIGURE 12.10

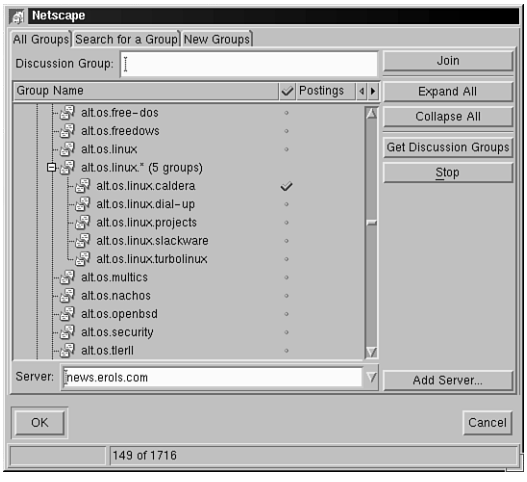
The Preferences dialog is where you set the name of your ISP's news server and your news directory.



You'll be returned to the Discussions window. To get a list of newsgroups from your ISP, click the Join Groups button in the window's menu bar. A newsgroup dialog will appear, as shown in Figure 12.11. Make sure your ISP's news server is selected at the bottom of the dialog and then click the Get Discussion Groups button.

FIGURE 12.11

The newsgroup dialog is used to retrieve and subscribe to various Usenet newsgroups.



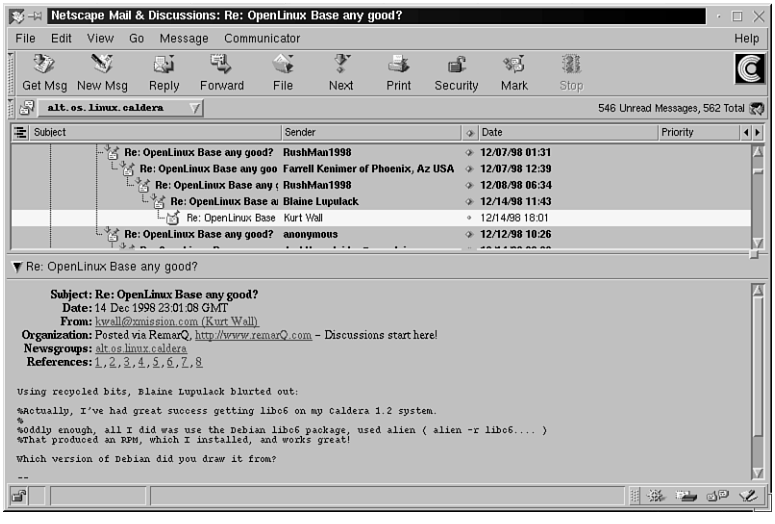
Discussions will retrieve the list of newsgroups available from your ISP. This operation, similar to that for `krn`, might take some time. When Discussions finishes, you'll see a list of newsgroups, sorted by hierarchy. Scroll through the list and open folders until you reach a newsgroup you like. Next, click the newsgroup and then click the Join button to subscribe. A small blue checkmark will appear to right of the newsgroup name. Repeat this step until you have subscribed to the desired number of groups. When finished, click the OK button.

Instead of clicking the Join button, you can click the tiny ball to the right of each newsgroup name to make the checkmark appear and subscribe to the group.

You're returned to the main Discussions window. Click the small plus sign (+) next to the name of your ISP's news server in the list of folders in the window. The list of your subscribed (joined) groups will appear. To retrieve articles for a newsgroup, double-click the newsgroup's name in the list. Discussions will launch the newsreading window with the list of articles for the group, as shown in Figure 12.12.

FIGURE 12.12

The Discussions newsreading window lists each newsgroups articles in a scrolling list.


Netscape Mail & Discussions: Re: OpenLinux Base any good?
File Edit View Go Message Communicator Help
Get Msg New Msg Reply Forward File Next Print Security Mark Stop
alt.os.linux.caldera
546 Unread Messages, 562 Total
Subject Sender Date Priority
Re: OpenLinux Base any good? RushMan1998 12/07/98 01:31
Re: OpenLinux Base any goo Farrell Kenimer of Phoenix, Az USA 12/07/98 12:39
Re: OpenLinux Base any (RushMan1998 12/08/98 06:34
Re: OpenLinux Base a Blaine Lupulack 12/14/98 11:43
Re: OpenLinux Base Kurt Wall 12/14/98 18:01
Re: OpenLinux Base any good? anonymous 12/12/98 10:26
Re: OpenLinux Base any good?
Subject: Re: OpenLinux Base any good?
Date: 14 Dec 1998 23:01:08 GMT
From: kwall@xmission.com (Kurt Wall)
Organization: Posted via RemarQ, http://www.remarQ.com – Discussions start here!
Newsgroups: alt.os.linux.caldera
References: 1, 2, 3, 4, 5, 6, 7, 8
Using recycled bits, Blaine Lupulack blurted out:
%Actually, I've had great success getting libc6 on my Caldera 1.2 system.
%
%Oddly enough, all I did was use the Debian libc6 package, used alien (alien -r libc6....)
%That produced an RPM, which I installed, and works great!
Which version of Debian did you draw it from?
--

Use the buttons on the newsreading window's menu bar during your group session.

To quickly jump to a list of articles for a different newsgroup, click the drop-down menu at the current newsgroup's name (as shown in Figure 12.12) and select a new group.

Before Posting to a Usenet Group

You should keep in mind several things when you feel tempted to post a message to a Usenet newsgroup. First, it's much better to lurk for a while before posting. Chances are that you'll find the answers you need before you post a message. Make sure you're posting to the right newsgroup or newsgroups. Check to make sure you're not cross-posting, or sending messages that may be off topic in other groups. Make sure you ask the right question in the right newsgroup. Woe be to the unfortunate miscreant who asks for Windows 98 advice in `comp.os.windows`! At best, you'll be ignored, and at the worst, you'll be flamed unmercifully and termed a *luser* (a user who's a loser).

Keep in mind that Usenet is worldwide. Your comments, opinions, jokes, and observations might not be welcome, funny, or relevant to other members of the Usenet community. What is true in the United States might not be true in other countries.

If you're thinking about advertising your business or service in Usenet newsgroups, post your "advertisement" in the proper newsgroup (for example, if you have something to sell). Spamming newsgroups with your ads, in this author's opinion, should be cause for retribution worse than social ostracism. There are more than one or two of the 50,000-plus newsgroups where you can post messages to sell stuff.

Asking for help? You'll have much better success in getting help from other people if your subject line is a good summary of your request:

```
Subj: Help! How do I recover my Linux filesystem?
```

Finally, one of the things you should know about Usenet is that there are, for all practical purposes, no rules. You'll converse with all kinds of people from countries all over the world. Some people are nice, and others are, well, not so nice. The good news is that the good-hearted newsgroup posters are in the majority.

Every new Usenet person should subscribe to `news.announce.newusers`. This newsgroup contains FAQs, etiquette guidelines, and handy tips to help you find answers. You'll read about the history of Usenet and find interesting statistics and a copy of the latest, complete listing of newsgroups.

Summary

This hour introduced four different Usenet newsreaders for OpenLinux. As you probably learned, each program allows you to easily read news but offers different features and requires a different configuration. Reading Usenet news is an addictive pastime that can offer great rewards when you're looking for information or troubleshooting tips about nearly any subject.

Q&A

Q What other newsreaders are included on my OpenLinux CD-ROM?

A You'll find several other newsreaders for the console or the X Window System installed with OpenLinux. Try running the `knews`, `trn`, `nn`, or `xrn` readers from the command line of a terminal window. These programs are also capable newsreaders (although perhaps not as popular with the Linux crowd as with users of other variants of the UNIX operating system).

Q Are there any newsreading utilities included with OpenLinux?

A Yes. See the `pnews`, `lmove`, `lpost`, `newsetup`, and `newsgroups` commands.

Q I'd like to read my news articles after closing down my PPP connection with my ISP. Is there a program I can use to do this?

A Use the `suck` command. This program will download articles from your ISP and save the news feed according to the command line you specify, such as to a single file, separate files, or indexed file format suitable for other newsreaders. See the `suck` man page for details.

Q Is it true that I can use the `pine` email program to read Usenet news?

A Yes! The `pine` program is almost two programs in one. Although most people will use `pine` primarily as a mail handler, `pine` can be an efficient way to read news and can save you disk space if you don't have much room on your hard drive for other programs (especially if you're using a laptop computer). Specify your ISP's news server in the `.pinerc` file in your home directory or through `pine`'s `setup` and `config` commands. To read news, make sure you're connected to your ISP and then run `pine`. Move to the folder list view, press the Enter key, and then move down to the news collection expanded list and press the Enter key.

Exercises

1. Use `krn`'s search for newsgroup function to find a newsgroup about a topic when reading news. Which button in `krn`'s window is used to search for a newsgroup?
2. Find out how many newsgroups your ISP supports. Are all newsgroups available through your service? Were any limitations on the number of groups spelled out in your service contract?
3. Editing a text list of groups (such as `.jnewsrc` or `.newsrc`) for reading news is a handy way to limit the availability of newsgroups for the younger crowd. How else can you limit or protect this list from being modified?

HOUR 13

Internet Downloading and Browsing

This hour introduces you to programs you use to get information and programs from the Internet. I assume that you are signed up with an Internet Service Provider (ISP) and that you configured your OpenLinux system to start and stop Point-To-Point Protocol network connections.

If you already have an account with a local ISP but have not configured your Linux system to connect to the Internet, read Hour 10, "Connecting to the Internet," for instructions.

I first introduce you to two Internet file transfer programs and then cover some of the many World Wide Web browsers you can find for Linux.

Using File Transfer Protocol Programs to Get Files

New Term There are several ways to retrieve files from other computers on the Internet. You can use email or a Web browser, but if you're interested in just getting files into your computer, you can use the `ftp` (file transfer) program. The `ftp` program is one of the oldest programs to support the standard *File Transfer Protocol*, or FTP, and was the original program designed to transfer files. The FTP protocol enables you to send and receive files interactively with `get` and `put` commands.

The next section shows you how to use two FTP transfer programs, `ftp` and `ncftp`.

Retrieving Files with the `ftp` Command

The `ftp` command, found under the `/usr/bin` directory, has five different command-line options but is most often used with a hostname, or name of a remote computer, for example:

```
# ftp ftp.mcp.com
```

This command line specifies that you want to connect to the `ftp` server at Macmillan Publishing. You don't have to specify a hostname on the command line because you can run the `ftp` program interactively, repeatedly connecting to and disconnecting from different computers. The `ftp` command has more than 70 different built-in commands, including a help facility. This hour doesn't cover all the different commands, but you can get more information about these commands by reading the `ftp` program's manual page or by using the built-in `help` command.

Some of the commands you're most likely to use, especially when all you want to do is retrieve some programs or source code from Linux sites, are the following:

`!`—Prompts for and runs a shell command. This is a handy way to view the contents of files, delete files you download, or check on how much hard drive space you have left.

`ascii`—Downloads any specified files in text form.

`binary`—Downloads any specified files in binary form. You must use this command before downloading most compressed Linux files.

`bye`—Closes any open connection and exits the `ftp` program.

`cd` —Changes directories, for example:

```
> cd ..
```

`close`—Closes the current connection.

`get`—Downloads a specific file from the current directory to your current directory, for example:

```
> get killbarney.tgz
```

`ls` —Lists files or directories in the current directory.

`mget`—Downloads several files, one after another, that match a specified pattern, for example:

```
> mget kill*.tgz
```

`open`—Opens a connection to a specified host, for example:

```
> open ftp.mcp.com
```

`prompt`—Toggles interactive prompting (such as the use of `y` or `n` when downloading multiple files).

For example, to run the `ftp` command interactively, all you have to do is type the following:

```
# ftp
ftp> help
Commands may be abbreviated.  Commands are:

!               debug           mdir            sendport        site
$               dir             mget            put             size
account         disconnect      mkdir           pwd             status
append          exit            mls             quit            struct
ascii           form            mode            quote           system
bell            get             modtime         recv            sunique
binary          glob            mput            reget           tenex
bye             hash            newer           rstatus         tick
case            help            nmap            rhelp           trace
cd              idle            nlist           rename          type
cdup            image           ntrans          reset           user
chmod           lcd             open            restart         umask
close           ls              prompt          rmdir           verbose
cr              macdef          passive         runique         ?
delete          mdelete         proxy           send
ftp> help exit
exit            terminate ftp session and exit
ftp> help bye
bye             terminate ftp session and exit
ftp> bye
#
```

If you have a shell or login account with your ISP, you can run into problems when downloading large files if your ISP enforces disk quotas, which limit the amount information that can be stored in a user's directory. See if your ISP lets you first change the directory to a `/tmp` directory if using `ftp`, and then open a connection to download any large files. The `/tmp` directory is later cleaned out by any housekeeping `crontab` routines to make more storage room, and you can download large files without hitting hard limits on quotas.

To demonstrate the `ftp` program in action, I show you a sample session used to download a compressed file from the University of North Carolina's famous Linux repository (formerly known as sunsite, but now named MetaLab):

```
# ftp ftp.metalab.unc.edu
Connected to helios.metalab.unc.edu.
220-                Welcome to UNC's MetaLab ftp archives!
220-            (at the site formerly known as sunsite.unc.edu)
220-
220-You can access this archive via http with the same URL.
220-
220-example:    ftp://metalab.unc.edu/pub/Linux/ becomes
220-           http://metalab.unc.edu/pub/Linux/
220-
220-For more information about services offered by MetaLab,
220-go to http://metalab.unc.edu
220-
220-WE'RE BACK TO USING WUFTPD.
220-You can still get tarred directories if you issue the following
➥command:
220-    get dirname.tar
220-You can also get gzipped or compressed tarred directories by
➥ following
220-the .tar with .gz or .Z, respectively.
220-
220-Have any suggestions or questions? Email ftpkeeper@metalab.unc.edu.
220-
220 helios.oit.unc.edu FTP server (Version wu-2.4.2-academ[BETA-13](6)
➥Thu Jul 1
7 16:22:52 EDT 1997) ready.
Name (ftp.metalab.unc.edu:bball): anonymous
331 Guest login ok, send your complete e-mail address as password.
Password:
230 Guest login ok, access restrictions apply.
Remote system type is UNIX.
Using binary mode to transfer files.
ftp> cd pub/Linux
```

```
250-README for
250-
250-Linux: A copylefted Unix-like operating system for 80[3456]86,
250-       DEC Alpha, Sun SPARC, Motorola 68k, PowerPC/PowerMac,
250-       ARM, Mips R[3,4]x00, Fujitsu AP/1000+ and more to come.
250-
250-Mirrors are better!  Look at the MIRRORS file to find one near you.
250-
250-Email linuxguys@sunsite.unc.edu with comments/complaints about this
➥archive.
250-
250-Please see HINTS for information on how to get most effective use
➥out of
250-this archive.  HINTS was last updated on 17 March 1997.
250-
250 CWD command successful.
ftp> cd apps
250-README for /apps
250-
250-What you'll find here: large useful packages and applications for
➥Linux
250-
250-
250 CWD command successful.
ftp> ls
200 PORT command successful.
150 Opening ASCII mode data connection for /bin/ls.
total 41
-rw-rw-r--   1 347      1002         1573 Jul 04  1998 !INDEX
-rw-rw-r--   1 347      1002         2697 Jul 04  1998 !INDEX.html
-rw-rw-r--   1 347      1002         2823 Jul 04  1998 !INDEX.short.
➥html
drwxrwsr-x  26 347      1002          512 Jul 19  1998 .
drwxrwsr-x  25 67       1002         1024 Jan 26 05:28 ..
drwxrwsr-x   2 347      1002          512 Mar 25  1997 MGR
-rw-rw-r--   1 347      1002           91 Jul 04  1998 README
drwxrwsr-x   2 347      1002          512 Sep 03 21:15 appliance
drwxrwsr-x   2 347      1002          512 Dec 27 18:59 cai
drwxrwsr-x   2 347      1002          512 Dec 24 19:44 chinese
drwxrwsr-x   4 347      1002         2560 Jan 25 22:44 circuits
drwxrwsr-x   2 347      1002          512 Apr 01  1997 conferencing
drwxrwsr-x   2 347      1002         1024 Nov 27 18:49 crypto
drwxrwsr-x  12 347      1002          512 Jul 04  1998 database
drwxrwsr-x   4 347      1002          512 Jan 25 21:14 doctools
drwxrwsr-x   7 347      1002          512 Mar 28  1998 editors
drwxrwsr-x   6 347      1002          512 Jul 15  1998 financial
drwxrwsr-x  13 347      1002          512 Jan 25 22:47 graphics
drwxrwsr-x   8 347      1002         1024 Sep 27 20:03 ham
drwxrwsr-x   7 347      1002         1024 Oct 20 20:34 math
drwxrwsr-x   2 347      1002         1536 Jan 25 22:55 misc
drwxrwxr-x   2 347      1002          512 Oct 22 19:10 office
```

```
drwxrwsr-x   2 347      1002         1024 Jan 22 21:05 religion
drwxrwsr-x   4 347      1002         1024 Dec 08 20:31 reminder
drwxrwsr-x   7 347      1002          512 Mar 28  1997 serialcomm
drwxrwsr-x  19 347      1002         1536 Jan 11 15:47 sound
drwxrwxr-x   6 347      1002         1536 Nov 19 21:37 tex
drwxrwsr-x   2 347      1002         2048 Jan 25 21:02 video
drwxrwsr-x   6 347      1002          512 Jul 09  1998 wp
drwxrwsr-x  13 347      1002          512 May 19  1997 www
226 Transfer complete.
ftp> cd appliance
250-README for apps/appliance
250-
250-What you'll find here: household appliance control
250-
250-
250 CWD command successful.
ftp> ls
200 PORT command successful.
150 Opening ASCII mode data connection for /bin/ls.
total 250
-rw-rw-r--   1 347      1002          634 Sep 03 21:15 !INDEX
-rw-rw-r--   1 347      1002         2454 Sep 03 21:15 !INDEX.html
-rw-rw-r--   1 347      1002         1197 Sep 03 21:15 !INDEX.short.
➥html
drwxrwsr-x   2 347      1002          512 Sep 03 21:15 .
drwxrwsr-x  26 347      1002          512 Jul 19  1998 ..
-rw-rw-r--   1 347      1002           79 Sep 03 21:15 README
-rw-rw-r--   1 754      1002          861 Aug 24 05:05 alarm-0.20b.lsm
-rw-rw-r--   1 754      1002         6559 Aug 24 05:05 alarm-0.20b.tar.gz
-rw-rw-r--   1 347      1002        14895 Aug 25  1997 cheaplightswitch
 ➥ -1.0.tgz
-rw-rw-r--   1 347      1002          666 Aug 25  1997 cheaplightswitch.
➥lsm
-rw-rw-r--   1 347      1002        29617 May 19  1998 irx-v0.1.tgz
-rw-rw-r--   1 347      1002          691 May 19  1998 irx.lsm
-rw-rw-r--   1 347      1002          469 Jun 16  1998 netlitng.lsm
-rw-rw-r--   1 347      1002        28081 Jun 16  1998 netlitng.tgz
-rw-rw-r--   1 347      1002         1007 Jul 14  1997 twd-0.2.lsm
-rw-rw-r--   1 347      1002        21903 Jul 14  1997 twd-0.2.tgz
-rw-rw-r--   1 347      1002          580 Jan 22  1996 x-automate
➥-1.00.lsm
-rw-rw-r--   1 347      1002       110006 Jan 23  1996 x-automate
➥-1.00.tgz
-rw-rw-r--   1 347      1002         1290 Mar 07  1997 x10-amh-v1.06.lsm
-rw-rw-r--   1 347      1002        12168 Mar 07  1997 x10-amh-v1.06.tgz
226 Transfer complete.
ftp> binary
200 Type set to I.
ftp> get netlitng.tgz
local: netlitng.tgz remote: netlitng.tgz
200 PORT command successful.
```

```
150 Opening BINARY mode data connection for netlitng.tgz (28081 bytes).
226 Transfer complete.
28081 bytes received in 8.35 secs (3.3 Kbytes/sec)
ftp> bye
221 Goodbye.
#
```

The session shows that I specified the `ftp` server at MetaLab as the host computer I wanted to connect to and retrieve files. By convention, many system administrators create and maintain a user called `ftp` and a directory called `ft` to accommodate the distribution of information, software, and software updates.

An `ftp` user with a directory under the `/home` directory exists on your OpenLinux system. This directory (`/home/ftp`) is where you end up if you log in anonymously. If you log in to your computer with your username and password, you end up in your home directory.

By convention, when you use the `ftp` program to connect to other computers, you enter your username at the `Name:` prompt as **`anonymous`**, followed by a password in the form of a mail address, such as `user@somewhere.com`.

You can see that after I logged in, I changed the directory to the `pub/Linux` directory. I then changed to the `apps` directory and changed directory to the `appliance` directory. If I had known the full path to the directory I wanted, I could have specified that pathname in a single `cd` command, for example:

```
cd pub/Linux/apps/appliance
```

I then enabled the `ftp` command's binary transfer mode, retrieved the file `netlitng.tgz` with the `get` command, and then logged off and exited the `ftp` program with the `bye` command. As you can see, using the `ftp` command is not hard and is an easy way to retrieve files.

You can also open an anonymous `ftp` connection to your own computer to demonstrate how `ftp` works without having an Internet connection available. You can specify the hostname of your computer, which you can get with the `hostname` command or by using your computer's Internet Protocol address, for example:

```
# hostname
presario.localhost.localdomain
# ftp presario
Connected to presario.localhost.localdomain.
220 presario.localhost.localdomain FTP server (Version wu-2.4.2-academ
➥[BETA-17](1) Wed Aug 19 02:55:52 MST 1998) ready.
```

```
Name (presario:bball): anonymous
331 Guest login ok, send your complete e-mail address as password.
Password:
230-Welcome the OpenLinux 1.3 from Caldera Systems, Inc.!
230-
230-
230 Guest login ok, access restrictions apply.
Remote system type is UNIX.
Using binary mode to transfer files.
ftp> ls
200 PORT command successful.
150 Opening ASCII mode data connection for /bin/ls.
total 6
drwxr-xr-x   5 root     root         1024 Jan 11 16:11 .
drwxr-xr-x   5 root     root         1024 Jan 11 16:11 ..
d--x--x--x   2 root     root         1024 Oct 18 14:09 bin
d--x--x--x   2 root     root         1024 Oct 18 14:09 etc
drwxr-sr-x   2 root     ftp          1024 Jan 11 16:11 pub
-rw-r--r--   1 root     ftp            55 Jan 11 16:10 welcome.msg
226 Transfer complete.
ftp> bye
221 Goodbye.
#
```

Note that if you perform an `ftp` login without an existing username or password, you end up in an `ftp` directory. You can also log in to other computers using an assigned username and password, but for this example, I use my own system and the computer's host IP address:

```
# ftp 127.0.0.1
Connected to 127.0.0.1.
220 presario.localhost.localdomain FTP server (Version wu-2.4.2-academ
➥ [BETA-17](1) Wed Aug 19 02:55:52 MST 1998) ready.
Name (127.0.0.1:bball): bball
331 Password required for bball.
Password:
230 User bball logged in.
Remote system type is UNIX.
Using binary mode to transfer files.
ftp> ls dos/mp3music
200 PORT command successful.
150 Opening ASCII mode data connection for /bin/ls.
total 40616
drwxr-xr-x   2 bball    users        4096 Jan 24 23:25 .
drwxr-xr-x   8 bball    users        4096 Jan 24 22:27 ..
-rwxr-xr-x   1 bball    users     5041544 Jan 25 00:24
➥Rippingtons-A Place for Lovers.mp3
-rwxr-xr-x   1 bball    users     4341612 Jan 25 00:48
➥Rippingtons-Carnival!.mp3
```

```
-rwxr-xr-x   1 bball    users     5704848 Jan 25 01:15
➥Rippingtons-Highroller.mp3
-rwxr-xr-x   1 bball    users     5480811 Jan 25 00:14
➥Rippingtons-Indian Summer.mp3
-rwxr-xr-x   1 bball    users     5538079 Jan 25 01:02
➥Rippingtons-Moka Java.mp3
-rwxr-xr-x   1 bball    users     5704686 Jan 25 09:55
➥Rippingtons-St. Tropez.mp3
-rwxr-xr-x   1 bball    users     4606027 Jan 25 00:01
➥Rippingtons-Vienna.mp3
-rwxr-xr-x   1 bball    users     5150057 Jan 25 00:48
➥Rippingtons-Weekend in Monaco.mp3
226 Transfer complete.
ftp> bye
221 Goodbye.
#
```

In this example, after logging in with my system username and password, I ended up in my home directory instead of the default `ftp` directory. I then listed the contents of a folder on another mounted file system (you can't tell from the pathname or the files). If you have an open PPP connection with your ISP and other users know your computer's IP address, you and other users can access your system's files and upload and download files.

Downloading with the `ncFTP` Program

The `ncftp` command, found under the `/usr/bin` directory, is much like the original `ftp` command but features some unique improvements, such as the following:

- A visual mode with colors
- A status bar with a separate command line and scrolling window
- Visual status of downloading—a progress meter to show elapsed and remaining time for file downloads
- Bookmarks and a bookmark editor, so you can use abbreviated hostnames of computers

Like the `ftp` command, `ncftp` also has built-in help. The `ncftp` command, by Mike Gleason of NCEMRSoft, also sports a number of interesting command-line options. If you know the hostname of the computer and the complete path to a desired file, you can retrieve the file with a single command line, for example:

```
# ncftp -a ftp://ftp.metalab.unc.edu/pub/Linux/apps/appliance/
➥netlitng.tgz

# nctp -a ftp.metalab.unc.edu/pub/Linux/apps/appliance/netlitng.tgz
```

Both command lines connect to the `ftp.metalab.unc.edu` host, log in anonymously, and then retrieve the file. This is a handy way to retrieve known files from remote computers. These command lines can also be used in shell scripts or combined with pipes to other commands to process the incoming files. You can, for example, automatically translate incoming graphics files and save them in a specified directory:

```
# ncftp -c rsd.gsfc.nasa.gov/pub/Weather/GOES-8/gif/mapped/color/
➥conus/latest.gif ¦ giftopnm ¦ ppmtopcx >/home/ftp/weather.pcx
```

This example downloads a `.GIF` format weather satellite image, translates the graphic into `.pnm` format and then `.pcx` format, and saves it in your system's `ftp` area. You can use this approach to download and update files automatically, especially when used in a `crontab` file. (For details about using `crontab`, see Hour 24, "Using Scheduling to Automate System Management," or Hour 18, "Personal Productivity Tools").

The `ncftp` status bar is helpful when interactively downloading files. Although I can't show you the animation of the progress meter, when you use `ncftp` to download files, you get information on how the downloading is going, for example:

```
wustl> get app-defaults.color

Receiving file: app-defaults.color
100%  0 ==================================> 6583 bytes. ETA:  0:00
app-defaults.color:  6583 bytes received in 5.77 seconds, 1.11 kB/s.
ftp.wustl.edu   /packages/NCSA/Web/Mosaic/Unix/binaries/app-defaults
wustl>
```

This shows a completed download of the X11 application defaults file for the Mosaic Web browser.

If you do a lot of downloading via FTP using anonymous log in, create a file named `.netrc` in your home directory. Enter a single line like this:

`default login anonymous password` *`yourusername@yourISP.com`*

Use your email address for *`yourusername@yourISP.com`*. The next time you use the `ftp` or `ncftp` command, you're automatically logged in!

Browsing the World Wide Web with Linux Browsers

This section introduces you to several Web browsers for Linux. You can find these browsers on your OpenLinux CD-ROM included with this book.

You can find other browsers, such as `Chimera`, `Mosaic`, and `qweb` at `http://metalab.unc.edu/pub/Linux/apps/www/browsers`.

This book doesn't have enough room to cover these browsers in detail. If you're interested in learning about Web browsers or writing your own Web pages, I suggest you look at the following books:

HTML by Example, by Todd Staufer; Que

Using HTML, by Mark Brown, John Jung, and Tom Savola; Que

Fast Browsing with the `lynx` Command

The Lynx browser, originally sponsored by the University of Kansas, does not support graphics, sound, or any of the other plug-in features of today's modern Web browsers. You can really like Lynx anyway because it's fast, efficient, and does not take up a lot of disk space.

Lynx was designed to run on regular displays, or terminals, so you don't need to run the X Window System in order to use it. This program is ideal for quickly browsing Web pages to get the information you need without the "World Wide Wait" of too-large graphics or animations that just waste bandwidth.

NEW TERM The Lynx browser has 66 different command-line options, but it's easy to use. If you properly set up your system and start your PPP connection, you can start browsing by specifying a *Uniform Resource Locator* (URL), or Web address, on the command line, for example:

```
# lynx http://www.mcp.com
```

Figure 13.1 shows the Lynx browser.

If you need to fine-tune some of the ways the `lynx` command works, you can edit its configuration file, `lynx.cfg`, in the `/usr/lib` directory. I suggest that you make a copy of this file and copy it to your home directory with `.lynxrc` as the filename. In this file, you can set a number of Lynx features. For example, if you specify the name of your ISP's news server, you can read news:

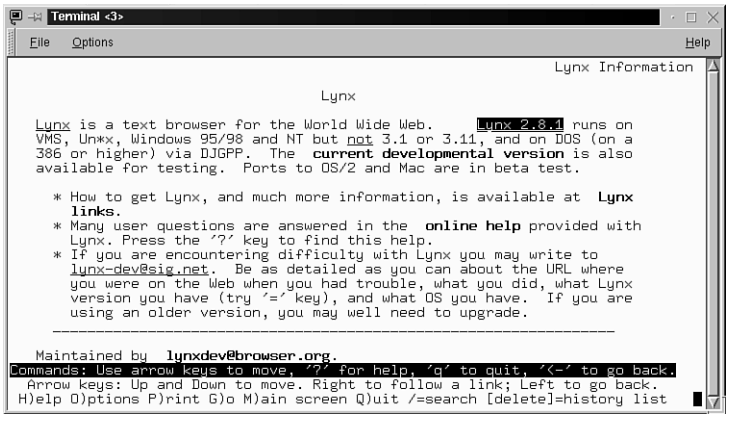
```
NNTPSERVER:your.ISPnewserver.com
```

After you make this change, you can try to browse news with this:

```
# lynx news://your.ISPnewserver.com
```

FIGURE 13.1

The Lynx text-only Web browser is a compact, efficient program you can use to quickly browse Web pages without waiting for graphics to load.


Terminal <3>
File Options Help
Lynx Information
Lynx
Lynx is a text browser for the World Wide Web. Lynx 2.8.1 runs on VMS, Un*x, Windows 95/98 and NT but not 3.1 or 3.11, and on DOS (on a 386 or higher) via DJGPP. The current developmental version is also available for testing. Ports to OS/2 and Mac are in beta test.
* How to get Lynx, and much more information, is available at Lynx links.
* Many user questions are answered in the online help provided with Lynx. Press the '?' key to find this help.
* If you are encountering difficulty with Lynx you may write to lynx-dev@sig.net. Be as detailed as you can about the URL where you were on the Web when you had trouble, what you did, what Lynx version you have (try '=' key), and what OS you have. If you are using an older version, you may well need to upgrade.
Maintained by lynxdev@browser.org.
Commands: Use arrow keys to move, '?' for help, 'q' to quit, '<-' to go back.
Arrow keys: Up and Down to move. Right to follow a link; Left to go back.
H)elp O)ptions P)rint G)o M)ain screen Q)uit /=search [delete]=history list

You can also use the Lynx browser to retrieve files without browsing. By using this approach, you can automatically research or get information on a regular basis:

```
# lynx http://www.yahoo.com/headlines/news -dump >news.raw
```

In this example, the content of the Web page is downloaded by the `lynx` command and then redirected to the file `news.raw`. Lynx also downloads files just like other browsers if you press the Enter key while your cursor has a file or link highlighted. The basic navigation keys for this browser are the cursors (to scroll up and down the current page, to go back to a previous page, or forward to the next), the Enter key (to load a link), and the Tab key (to go to the next link). To get help while using `lynx`, type the question mark (`?`) key.

Exploring Netscape Communicator

The Netscape Communicator Web browser, by Netscape Communications (soon to merge with America Online), is one of the most popular browsers for all computer systems. You can find a copy installed on your system that is specifically configured for OpenLinux (see Figure 13.4).

Netscape, like most well-behaved X11 clients, uses several X11 Toolkit options. For example, if you don't like the large initial window, you can specify a smaller starting window using geometric settings.

See Hour 7, "Using the X Window System," for a discussion of X11 toolkit options, such as geometry settings.

You can get a list of Netscape's initial command-line options with the `-help` option. Some common options are listed in Table 13.1.

TABLE 13.1 COMMON NETSCAPE COMMUNICATOR COMMAND-LINE OPTIONS

Description	*Option*
Display version	`-version`
Don't remember session settings	`-no-session-management`
Don't remember window settings	`-dont-save-geometry-prefs`
Don't show license page	`-no-about-splash`
Ignore saved window settings	`-ignore-geometry-prefs`
Launch to Composer	`-composer` or `-edit`
Launch to Discussions (newsreader)	`-discussions` or `-news`
Launch to Messenger	`-messenger` or `-mail`
Limit colors	`-install`
Set X11 *resource* (from the file `Netscape.ad` under the `/opt/netscape/communicator` directory)	`-xrm` *resource*
Show GUI help	`-nethelp`
Show help	`-help`
Start, and then iconify	`-iconic`
Start as a floating toolbar	`-component-bar`
Use black and white	`-mono`
Use server *svr*	`-display` *svr*
Use window of *W*x*H* at *X*,*Y*	`-geometry=WxH+X+Y`
Use *X* colors	`-ncols` *X*

Several of these options are useful if you start Netscape from the command line of a terminal window. For example, as I pointed out earlier in this hour, the geometry settings can help reduce the initial window size of your browser. A much better option, especially for laptop users with little screen real estate, is the `-component-bar` option, for example:

```
# netscape -component-bar &
```

This command runs Netscape, but the application and its additional components, which include Mailbox, Discussions, and Composer, appear in a short vertical floating window (shown in Figure 13.2) you can put off to one side of the screen. You can then run the desired component by clicking one of the icons in the small window.

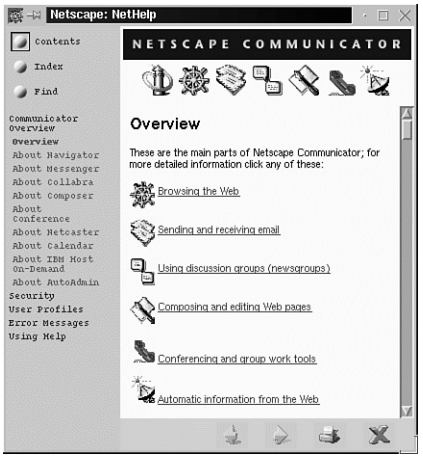
FIGURE 13.2

Netscape Communicator offers a convenient and compact component bar for small desktops that can be used to launch Navigator and other components.

If you need help using Netscape, use Netscape's Help menu information system. To get help, open the Help menu, and click the Help Contents menu item. A help dialog box appears, as shown in Figure 13.3. Unlike some browsers, Netscape comes with all the help files you need to get started. You can find information about each component and how to set up and use them, along with a full discussion of HTML page composition.

FIGURE 13.3

Netscape Communicator comes with a complete help and learning system.



You can launch Netscape from the command line by clicking its icon in your Looking Glass desktop or by clicking its icon on your desktop's panel in KDE. After Netscape starts, the Navigator main window appears. If you click in Netscape's Location field or on the Home button in Netscape's button bar, Netscape loads an introductory help page on your system, using the address `file:/usr/doc/html/Caldera_Info` as shown in Figure 13.4.

FIGURE 13.4

Netscape Communicator automatically displays local links to OpenLinux and Linux documentation installed on your computer.

Netscape: Online Documentation
File Edit View Go Communicator Help
Back Forward Reload Home Search Netscape Print Security Stop
Bookmarks Location: file:/usr/doc/html/Caldera_Info What's Related
WebMail People Yellow Pages Download New & Cool Channels
The Easiest, Most Powerful LINUX system
Caldera systems, inc.
Website Resources
Online Documentation
Looking Glass Desktop Interface User's Guide
Linux Installation and Getting Started Guide

This is a handy and convenient way to read much of the documentation included with OpenLinux and is a good place to start reading or searching if you want to learn more about your system.

To browse to an Internet address, make sure you have an active Internet connection, then click the Location field, and type a URL. Netscape accepts several types of URLs:

- `about:mozilla` The Mozilla Easter egg
- `file://` To read a local file or display a local graphic
- `ftp://` To log in to and display a remote FTP server
- `http://` To load and display a remote Web page
- `news:`*`your.favorite.newsgroup`* To read Usenet articles

NEW TERM The Linux version of Netscape Communicator also supports many different *plug-ins*, or additional programs that add features to the browser. Some of these plug-ins enable you to listen to live radio or watch recorded or live video. For more information about using plug-ins with Netscape, browse to the following:

```
http://home.netscape.com/plugins/index.html
```

An interesting plug-in is the RealPlayer application. This plug-in plays stereo music from live Internet radio stations around the world and can display video clips or live TV in a Netscape Web page or separate window. See Figure 13.5.

FIGURE 13.5

The RealPlayer plug-in from RealNetworks displays live video and audio over your PPP connection.

Netscape Communicator automatically displays local links to OpenLinux and Linux documentation installed on your computer.

To see a current list of live TV and radio stations, browse to the following:

```
http://www.timecast.com/stations/realvideo.html
```

For more information about getting the latest RealPlayer plug-in, browse to the following:

```
http://www.real.com/products/player/50player/downloadrealplayer.html
```

Chatting with Internet Relay Chat

The `irc` (Internet relay chat) command, found under the `/usr/bin` directory, is a program you can use to converse with other people on the Internet. When you run `irc`, you can use the built-in `irc` commands to connect to chat servers, see who is chatting, and set many other options.

The `irc` command has built-in help on more than 110 different commands and topics, many of which have further subtopic help. In order to use this program, you need an active Internet connection. By default, the `irc` program tries to connect to a default chat server (another computer supporting IRC).

After you connect, the screen splits into two parts. Ongoing discussions and responses are in the majority of the upper portion of the screen. You can use the lower portion of the screen to enter commands to the `irc` program or send keyboard sentences as messages to different active discussions.

Using `irc` is much different from reading and responding to USENET newsgroups (see Hour 11, “Configuring Internet Email,” and Hour 12, “Configuring Internet News”). Discussions and comments are read and sent as you type. You should first browse

through the `irc` command's help facility, and read all the available introductory information about the following topics: basics, commands, etiquette, expressions, intro, ircII, menus, news, newuser, and rules.

To start `irc`, type the command on the command line of your console or an X11 terminal window, like this:

```
# irc
*** Connecting to port 6667 of server irc-2.mit.edu
*** Welcome to the Internet Relay Network bball
*** If you have not already done so, please read the new user
information with
/HELP NEWUSER
...
```

After you press Enter, a lot of information scrolls by on the screen. Next, get a list of the help topics by using the `irc /HELP` command, for example:

```
> /HELP newuser
> /HELP etiquette
```

The next step is to see what chat groups are active. Use the `/LIST` command. You see a list of groups with different names. To join a chat group, use the `/JOIN` command, followed by the name of the chat group (which is preceded by a pound sign), like this:

```
> /JOIN #linux
```

After you press Enter, you join the group and might see a message such as:

```
*** bball (~bball@207-132-114-136.s196.tnt2.brd.erols.com) has joined
channel #linux
*** Users on #linux: bball whizzo KerNElDudE cathyt Scrotty
```

Messages and chat sentences scroll by on your screen. If you type a sentence and press Enter, your message is sent to all the users in the chat area. To quit the chat session, use the `/LEAVE` command, like this:

```
> /LEAVE
```

After you press Enter, you can `/LIST` other groups or use the `/QUIT` command to exit IRC.

To find out more about participating in `irc` chat sessions, read the built-in help files, the ircII man page, and the documentation for `irc` under the `/usr/doc/irc` directory. Another place to learn more about chatting on the Internet is `http://www.irchelp.org`.

Installing and Configuring AOL Instant Messenger

AOL's Instant Messenger, or IM, is a fun and easy-to-use X11 client for chatting with friends over the Internet. The service is free, and you don't have to pay for the software. This client constantly checks and then instantly notifies you when a friend logs in the service. You can then send an instant message!

You have to first register at AOL's Web site and then download and install IM. Navigate to `http://www.aol.com/aim/home.html.` and sign up for the service by selecting a screen name and a password and entering your email address (you receive a confirmation message by email from AOL). Next, go to the download section, and select the Java version. It takes you about 20 minutes to download the five-megabyte file called `aim_linux.sh` (a self-extracting shell script).

After downloading, start the installation like this:

```
# sh aim_linux.sh
AOL Instant Messenger(TM) Registration Agreement

Your use of AOL Instant Messenger(TM) service ("Service") constitutes
your acceptance, and agreement with America Online, Inc. ("AOL"), as
follows: You represent and warrant that you are eighteen years or older.
You understand and agree that your use of the Service does not constitute
membership in the AOL service.  You agree that you will not use the
Service to publish, post, distribute or disseminate any defamatory,
obscene, or other unlawful material or information.  You further agree
that you will not use the Service to transmit unsolicited commercial
messages or use the Buddy Info screens to collect or harvest personal
information about users of the Service to transmit unsolicited commercial
messages. You will not decompile, reengineer or otherwise copy the
Service.
...
```

After several screens of information, you're asked this question:

```
Do you accept the license? (y/n)
```

Type a `y`. The script then reports the following:

```
Uncompressing and Installing AOL Instant Messenger.
```

IM is installed in your home directory in a directory named `aim`. Start your PPP connection to your ISP, and then launch `aim` like this:

```
# aim/aim&
```

After you press Enter, you see the main IM dialog box, as shown in Figure 13.6.

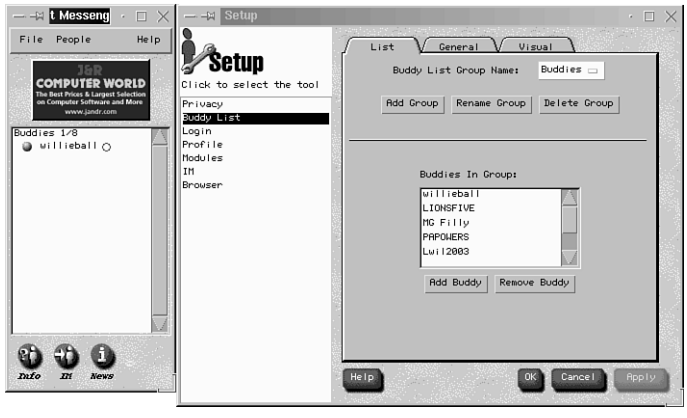
FIGURE 13.6

AOL's Instant Messenger for Linux is an Internet notification and chat tool.

Enter your username in the Screen Name field, press the Tab key, and then enter your password. After you press Enter and your username and password are verified, the IM main dialog box appears. To configure IM, select the File menu, and then click Options and the Edit Preferences menu item. A dialog box, shown in Figure 13.7, appears next to IM's main window.

FIGURE 13.7

The main IM window shows you when friends log on to the Internet, AOL, or Instant Messenger, whereas the Setup dialog box is used to configure IM.



You can now add an IM Buddy and set other options. When a buddy logs on, his or her name appears in your IM's buddy list. To send an instant message, click your buddy's name, and then click the IM button in the main dialog box. Enter your message, and then click the Send button to chat.

Connecting with Other Computers with the `telnet` Command

You can use the `telnet` command to log in to remote computers to run programs, view files, or download data. The `telnet` command has a number of options but is generally used with a hostname or remote computer system's name on the command line to start a telnet session, for example:

```
# telnet computer.somewhere.com
```

This command connects you to the remote computer, and you receive a login prompt. You generally need to have a username and password in order to enter the remote system. For security reasons, few computer systems enable unknown users anonymous access. You might be able to find a list of computer systems providing access by using your favorite search engines, such as through a Web search site.

If you "`telnet`" to a remote computer system through an active Internet connection or through a shell account through a direct dial-in to the computer, you can easily transfer programs using the `sz` and `rz` (send and receive) files (if those programs are resident on the remote computer). After you dial in to a remote computer directly through the phone line, you can transfer files to your computer with `sz -w 2048 filename.tgz`. This command sends the file `filename.tgz` using the ZMODEM communications protocol. Your communications program automatically starts receiving the file using this protocol (most communications programs, anyway). If you're connected through an Internet connection, the companion program, `rz`, automatically starts to receive the file. If not, you can start the `rz` program manually. See the `sz` and `rz` manual pages for more information.

You can also run the `telnet` command in an interactive mode, opening and closing sessions to different remote computers. Like the `ftp` command, the `telnet` command has built-in help. If you want to get a list of available help topics, you can use the question mark (`?`), for example:

```
# telnet
telnet> ?
Commands may be abbreviated.  Commands are:

close           close current connection
logout          forcibly logout remote user and close the connection
display         display operating parameters
mode            try to enter line or character mode ('mode ?' for more)
```

```
open            connect to a site
quit            exit telnet
send            transmit special characters ('send ?' for more)
set             set operating parameters ('set ?' for more)
unset           unset operating parameters ('unset ?' for more)
status          print status information
toggle          toggle operating parameters ('toggle ?' for more)
slc             change state of special charaters ('slc ?' for more)
auth            turn on (off) authentication ('auth ?' for more)
z               suspend telnet
environ         change environment variables ('environ ?' for more)
?               print help information
telnet>
```

If you want to experiment with this command without an active Internet connection, you can telnet to your own computer from a terminal window under X11 or through the console. As with the `ftp` command, first determine the hostname of your computer with the `hostname` command, and then either specify the hostname on the `telnet` command line or run `telnet` and use its `open` command to start the session, for example:

```
#  hostname
presario.localhost.localdomain
# telnet presario
Trying 127.0.0.1...
Connected to presario.localhost.localdomain.
Escape character is '^]'.

Caldera OpenLinux(TM)
Version 1.3
Copyright 1996-1998 Caldera Systems, Inc.

login: bball
Password:
You have old mail in /var/spool/mail/bball
Last login: Mon Jan 25 15:28:01 1999 on tty2
You have mail.
#
```

As you can see, after entering the username and password at the login prompt, you're presented with the shell prompt command line.

Summary

This hour introduced you to downloading and browsing on the Internet. You learned how to use the `ftp` command to connect to a remote computer and download files. You also learned about several Internet browsers included with OpenLinux. Finally, you learned about Internet Relay Chat and the `telnet` command.

Q&A

Q I clicked a link to download a file while using Netscape, but all I got was a bunch of garbage characters in a new window. What happened?

A The version of Netscape included with OpenLinux is configured to recognize several file types automatically and act accordingly. However, if you click a link to download an unrecognized file type, Netscape attempts to download the file into a window. The safest approach to downloading a file is to first hold down the Shift key and then click the link to download a file. Netscape then shows a file save dialog box, so that you can confirm the file save and start downloading.

Q I started downloading a file with Netscape. Can I go back to browsing and start downloading other files?

A Yes. You can run multiple downloads at the same time.

Q Are any other Web browsers included with OpenLinux?

A Yes. You can try the `amaya` Web browser for X11. This browser, according to its developers, is "a work in progress."

Q If I'm downloading files with Netscape, is it safe to send or retrieve mail?

A Yes, because you're using a network connection. However, you might find things slowing down a bit (depending on the type of Internet connection you use.

Q I tried `irc`, but there were some people using foul language and who were really nasty!

A Unfortunately, chat discussions are generally not moderated, so there's no one in charge. In general, members of Linux chat groups tend to be a bit more civilized.

Q I tried running Instant Messenger, but the program complained about not being able to find "Oscar.main"?

A This is a conflict with an installed Java Development Kit, JDK. Use `glint`, `lisa`, or `rpm` to remove the JDK package, and then restart IM.

Exercises

1. Download and install the RealPlayer for Netscape, and then connect to an Internet site with a live TV broadcast. Relax.
2. Connect to the Internet, and then start the `irc` command. Join a chat group, and watch the conversations.
3. Try using `ncftp` to download a known file from an FTP site. How can this program be useful?
4. Try the Netscape (Mozilla) Easter egg. What else do you see besides a quotation?

PART IV
Using Linux Productively

Hour

14 Text Processing

15 Preparing Documents

16 Graphics Tools

17 Learning Math and Financial Tools

18 Personal Productivity Tools

19 Home Office Management with StarOffice

20 Relaxation and Playing Linux Games

HOUR 14

Text Processing

This hour provides an overview of some word processing, or text editing, tools for OpenLinux. There are more than 100 text editors available for OpenLinux and more than one dozen on this book's CD-ROM. This hour shows you some of the highlights and features of using these editing tools. You'll find tips on installing and using some of the latest exciting software releases for OpenLinux, such as Corel's WordPerfect 8 and Star Division's StarOffice suite. Read on to learn the basics of using these tools and to see how to write and edit with OpenLinux.

Word Processors in the Linux Environment

Text editors are used by many different people in different vocations. Casual users, writers, programmers, and system administrators all use a text editor at one time or another in OpenLinux. You definitely need to know how to change your system's text configuration files to make OpenLinux work the way you want. What follows is an introduction to different word processors, text editors, and text tools you can use during your OpenLinux sessions.

Although how you use a computer dictates what type of software is important and should be installed, most people agree that more than half their time using a computer is spent using a text editor or word processor. This will change, of course, as computer software interfaces evolve and network communication becomes more integrated into our work environment, but in general, if you're using OpenLinux on your computer at home, you're probably going to be word processing or editing files a lot of the time.

The tools in this hour are interactive programs that enable you to enter text, move a cursor, or drop a menu. These programs and related files vary in size from more than 150 megabytes (such as the StarOffice suite) to fewer than 200,000 characters (such as the `pico` editor). Table 14.1 lists editors included with OpenLinux on this book's CD-ROM. You can also find more than two dozen text tools, such as line editors such as the `ed` or `ex` commands, that although not interactive, enable you to change, manipulate, or rearrange text.

TABLE 14.1 TEXT EDITORS FOR OPENLINUX

Name	*Description*
`aXe`	X11 text editor
CRiSPlite	The CRiSP programmer's editor
`ed`	Line editor
`edy`	Text editor (German)
`ee`, `easyedit`	`emacs` in easy mode
`elvis`, `xelvis`	Clone of the `vi` text editor
`jed`, `xjed`	Programmer's editor for console and X11
`joe`, `jmacs`, `jpico`, `jstar`	The `Joe`'s Own Editor and variants
`kedit`	Text editor included with the K Desktop Environment distribution
`nex`	Berkeley line editor clone
`nvi`	Berkeley `vi` editor clone
`pico`	Text editor (part of the `pine` electronic mail program's distribution)
`red`	Read-only line editor
`sed`	Stream editor
StarWriter	StarOffice word processor
`textedit`	Text editor for X11
`uemacs`	MicroEMACs text editor
`vim`	Vi IMproved, a programmers text editor
`xedit`	Text editor for X11

Features of the XEmacs Environment

What do you call a text editor that edits text, reads Usenet news, acts as a personal calendar and diary, sends electronic mail, is a programming language interpreter, plays games, is a Linux shell, and more? Why, `emacs`, of course!

Emacs, which stands for Editor Macros, was originally developed by Richard Stallman, the founder of the Free Software Foundation (FSF). The original `emacs` editor is distributed by the FSF as part of the GNU, or GNU's Not UNIX, project. XEmacs is a version of the original editor included with OpenLinux with improvements by companies such as Sun Microsystems and Lucid, Inc. and programmers, such as Ben Wing. Although there are some subtle differences (purist `emacs` users might insist that the only real version is from the FSF) between these versions, XEmacs is just as useful and capable as the FSF's GNU version.

Without a doubt, `emacs` is the most widely available and fully featured free editor and runs on more computer systems than any other text editor. There isn't enough time in this hour (or this book!) to cover all the features of this program.

Look at Table 14.2 to find most of the keyboard commands you can use to get started.

TABLE 14.2 BASIC EMACS COMMANDS AND KEYSTROKE COMBINATIONS

C-b=hold down Ctrl key, press b M-v=Press Esc key, press v

Action	*Key Combination*
Abort current operation	C-g
Cursor backward	C-b
Cursor down	C-n
Cursor forward	C-f
Cursor up	C-p
Delete character	C-d
Delete line	C-k
Delete word	M-d
Go to beginning of file	M-<
Go to beginning of line	C-a
Go to end of file	M->
Go to end of line	C-e
Help	C-h
Open file	C-x C-f

continues

TABLE 14.2 CONTINUED

Action	*Key Combination*
Page down	C-v
Page up	M-v
Quit	C-x C-c
Save As	C-x C-w
Save file	C-x C-s
Tutorial	C-h t
Undo	C-_ or C-x, u

Emacs has 22 different command-line options but is easy to start. To run `emacs` and open a text file for editing, specify the file's name on the command line, like this:

```
# emacs myfile.txt
```

This loads the editor and opens your file. If you specify `emacs` on the command line by itself, the program starts, displays an opening screen, and then clears when you touch the keyboard. Starting the `emacs` tutorial is highly recommended if you're a beginner. Hold down the Control key and press the H key. You see a prompt on the `emacs` command line at the bottom of screen. Type the **T** key, and then press Enter to start the tutorial.

If you enter this command at the shell prompt of an X11 terminal window, the X11 version of `emacs`, `xemacs`, with mouse and menu support, automatically starts (see Figure 14.1). But what if you want to run the console, or non-X11 version, of `emacs` instead? In this case, use `emacs` with the `-nw`, or no-window, command-line option, like so:

```
# emacs -nw myfile.txt
```

This command runs `emacs` inside your X11 terminal window without a menu bar. `xemacs` also obeys most X11 Toolkit options, such as geometry settings. Some of the X11 options you might find helpful include the following:

- `-geometry 80x24+400+200`—start in a window 80 characters wide by 24 lines, at screen position X (400) Y (200)
- `-fg` *`color`*—set foreground to *color*
- `-bg` *`color`*—set background to *color*
- `-cr` *`color`*—set text cursor to *color*
- `-mc` *`color`*—set mouse cursor to *color*

The colors you can use for the *color* settings are listed in the file `rgb.txt` under the `/usr/X11R6/lib/X11` directory.

Use these options, and others (such as X11 resource settings, discussed in Hour 7, "Using the X Window System") to customize how `emacs` looks when started in X11:

```
# emacs -geometry 80x24 -fg black -bg white blue -cr red
```

This starts `xemacs` in a window 80 characters wide and 24 lines high. The text is black with a white background. The cursor is red, and the mouse cursor is blue. Emacs also has 43 different X resource settings you can configure and enter into your `.Xresources` file in your home directory. You also can save editor defaults (such as word wrapping, or fill-mode on) in a file called `.emacs` in your home directory.

NEW TERM For example, you can automatically put `xemacs` into a text- and word-wrap mode, enable daily diary service, and put the current time in the *modeline*, a status bar in the main window. Create the `.emacs` file with `xemacs`, like this:

```
# xemacs .emacs
```

Next, type in the commands to customize `xemacs`:

```
(setq default-major-mode 'text-mode)
(setq text-mode-hook 'turn-on-auto-fill)
(require 'appt)
(display-time)
(appt-initialize)
```

Press Ctrl+X and Ctrl+S to save the file, and then press Ctrl+X and Ctrl+C to exit `xemacs`. The next time you start the editor, you see the time displayed in the modeline.

The `xemacs` program for OpenLinux comes in 14 different packages containing various files and utilities. If you install everything, `emacs` requires more than 60 megabytes of disk space. You can, however, save 45 megabtyes if you install the `xemacs` package, which contains the editor, documentation, and support routines.

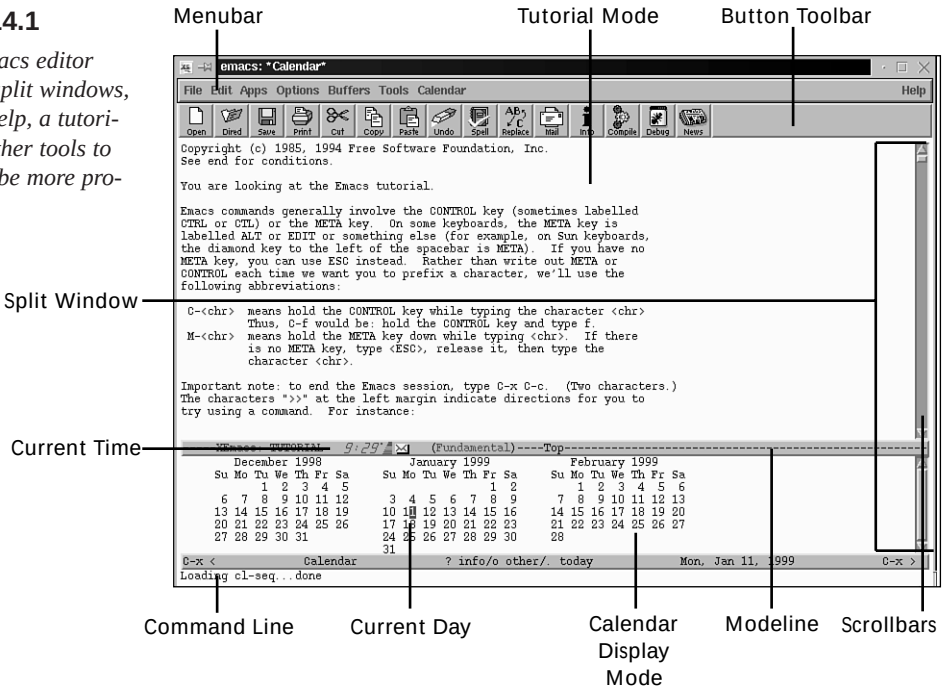
You can find documentation for `xemacs` under the `/usr/info/xemacs` directory. You also can read the `xemacs` manual page for an overview.

Variants of the VIsual iMproved Editor —`vim`

The `vim` editor, by Bram Moolenaar, is a text editor that is compatible with the original Berkeley Software Distribution `vi` editor by Bill Joy. An X11 version is called `gvim` and sports multiple scrolling windows and menus.

FIGURE 14.1

The XEmacs editor features split windows, built-in help, a tutorial, and other tools to help you be more productive.



Although the `vim :version` command shows that the systemwide `vimrc` and `gvimrc` resource files are located under the `/usr/share/vim` directory, this is not true: these files aren't installed with the `vim` package. However, you can create your own resource file after making changes to `vim` while running the editor and then using the `:mkvimrc` command. A resource file called `.vimrc` (which you can copy to `.gvimrc`) is created in your home directory and contains your changes. You can then edit and add your own commands, configurations, and menus to these files.

Several files and symbolic links to the `vim` editor are created on your system when you install the `vim` package from your CD-ROM:

- `/usr/bin/vi -> /bin/vi`
- `/bin/vi -> /bin/vim`
- `/bin/view -> /bin/vim`
- `/usr/bin/view -> /bin/vim`
- `/bin/vim`
- `/usr/X11R6/bin/gvim`

The vim editor, shown in Figure 14.2, is used as a replacement for the ex, vi, and view editors and is a visual editor supporting features such as cursor movement.

FIGURE 14.2

The vim editor features split windows and built-in help.

Terminal <2>
File Options Help
vim_help.txt For Vim version 4.5. Last modification: 1996 Sep 30
VIM help file
VIM stands for Vi IMproved. Most of VIM was made by Bram Moolenaar.
Move around: Use the cursor keys, or "h" to go left, "j" to go down, "k" to go up, "l" to go right.
Close this window: Use ":q".
Jump to a subject: Position the cursor on the tag between |bars| and hit CTRL-]. Use CTRL-T to go back.
With the mouse: ":set mouse=a" to enable the mouse (in xterm). Hit "g" and click left mouse button on tag between |bars|. Hit "g" and click right mouse button to go back.
Getting help on a specific subject: It is possible to go directly to whatever you want help on, by giving an argument to the ":help" command, |:help|. It is possible to further specify the context:
what prepend example
Normal mode commands (nothing) :help x
Visual mode commands v_ :help v_u
Insert mode commands i_ :help i_<Esc>
command-line commands : :help :quit
vim_help.txt [help][RO]
[No File]
:ta vim_help.txt

The vim editor features a number of improvements over the traditional vi editor, and has 23 different command-line options. In vim you can find built-in help, split-screen windows, block moves, command-line editing, horizontal scrolling, and word wrapping for word processing.

The gvim version of vim, used under the X Window System, has custom colors, window sizes, scrollbars, and menus. You can create your own set of menus containing specific vim commands and generate different versions of vim by saving your features in different gvim resource files. You can then use the -u command-line option to load a custom version.

Creating new menus for gvim is easy. You can, for example, group related macros or custom commands you create in a separate menu. For details about building custom menus, read the files vim_menu.txt and vim_gui.txt under the /usr/share/vim directory.

Most of the documentation for vim is contained in its built-in help, and 21 text files in the /usr/share/vim directory contain extensive instructions.

Features of Pine's pico Editor

The pico editor, included with the University of Washington's pine electronic mail program, is a compact, efficient, and easy-to-use editor usually used to compose or reply to email messages. This editor is a nifty replacement for all your editing needs and is

especially handy if you need a reliable text editor but don't have a lot of hard drive space (for example, on a laptop).

Despite its relatively small size, the `pico` editor has most of the features you expect in a word processor, including:

- word wrap
- built-in help
- word search
- paragraph justification
- text block move, copy, and delete
- directory mode for file and text insertion
- mouse support
- spell checking

The `pico` editor, shown in Figure 14.3, has 16 different command-line options and rudimentary but secure crash protection. In the untimely event of a power outage (just about the only way to crash Linux) `pico` attempts to save any work in progress before exiting, saving your file with a name ending in `.save` or if unsaved, in a file named `pico.save`.

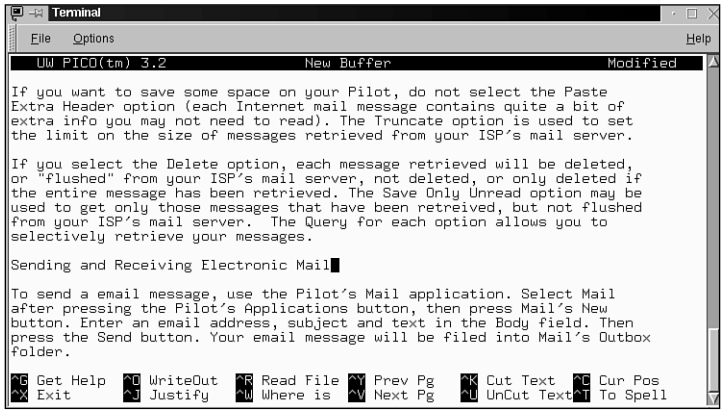

Terminal
File Options Help
UW PICO(tm) 3.2 New Buffer Modified
If you want to save some space on your Pilot, do not select the Paste Extra Header option (each Internet mail message contains quite a bit of extra info you may not need to read). The Truncate option is used to set the limit on the size of messages retrieved from your ISP's mail server.
If you select the Delete option, each message retrieved will be deleted, or "flushed" from your ISP's mail server, not deleted, or only deleted if the entire message has been retrieved. The Save Only Unread option may be used to get only those messages that have been retreived, but not flushed from your ISP's mail server. The Query for each option allows you to selectively retrieve your messages.
Sending and Receiving Electronic Mail
To send a email message, use the Pilot's Mail application. Select Mail after pressing the Pilot's Applications button, then press Mail's New button. Enter an email address, subject and text in the Body field. Then press the Send button. Your email message will be filed into Mail's Outbox folder.
^G Get Help ^O WriteOut ^R Read File ^Y Prev Pg ^K Cut Text ^C Cur Pos
^X Exit ^J Justify ^W Where is ^V Next Pg ^U UnCut Text ^T To Spell

FIGURE 14.3

The `pico` *editor, part of the* `pine` *electronic mail program distribution, is a compact and easy-to-use editor with nearly all the basic features of a text editor.*

This editor is an excellent choice for your `$EDITOR` environment variable, as it is much friendlier and easier to learn than the default `$EDITOR` variable, which points to the `vi` (`vim`) command. To use `pico` as your editor, open the file `.profile` in your home directory, and then add this line:

```
EDITOR=/usr/bin/pico; export EDITOR
```

As the root operator, set the `$EDITOR` variable for all users by editing the `/etc/profile` file, and insert the same line.

In both cases, save the file, and then use the following to use the new $EDITOR variable:

```
# source /etc/profile
```

After you do this, any Linux command requiring a default system editor uses pico.

You can find documentation for pico in its manual page, or you can use the lynx Web browser to read the pine and pico technical documentation with the following:

```
# lynx /usr/doc/pine-4.02/tech-notes/index.html
```

Five Editors in One—joe

The joe editor, by Joseph H. Allen, comes in five different versions: jmacs, joe, jpico, jstar, and rjoe. The jmacs version emulates the emacs editor. The jpico version emulates the pine mailer's pico text editor. The jstar version uses WordStar-compatible keyboard commands, whereas the rjoe program is a restricted editor.

For those of you who don't know about WordStar: this program was one of the first full-screen text editors with a spelling checker, originally developed and marketed for the CP/M operating system. In the early 1980s, WordStar was the most popular word processor for the DOS operating system, and its legacy is the Ctrl key "diamond." This meant that the user pressed the Ctrl key with the left pinky finger, and tapped the WER, ASDF, or XC keys to move within a document.

The joe configuration files (for each text mode) are found under the /usr/lib/joe directory. To create your own custom configuration, copy the file called joerc to your home directory, save it with the .joerc filename, and then edit this file to change the joe help menus, display, and keyboard commands.

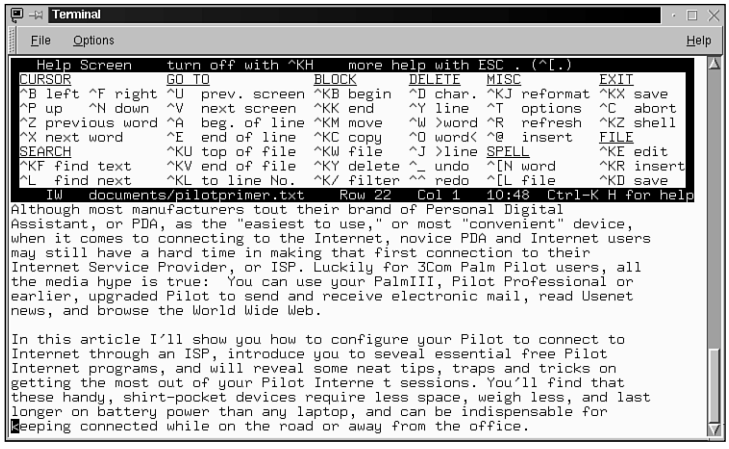
You can find documentation for the joe editor, shown in Figure 14.4, in its manual page (which needs to be spell checked) and by using its built-in help (Ctrl+X, K).

Configuring the jed Editor

The jed editor (shown in Figure 14.5), by John E. Davis, comes in two versions: one for the console (jed) and the other tailored for the X Window System (xjed). This editor can also emulate other editors, such as WordStar or Brief, using those programs' keyboard commands.

FIGURE 14.4

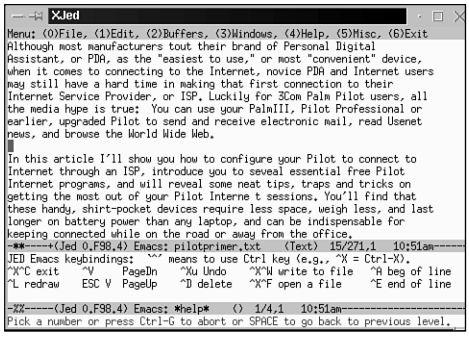
The `joe` *editor comes in five versions and can emulate the keyboard commands of several different editors, such as* `pico` *and* `emacs`.


Terminal
File Options Help
Help Screen turn off with ^KH more help with ESC . (^[.)
CURSOR GO TO BLOCK DELETE MISC EXIT
^B left ^F right ^U prev. screen ^KB begin ^D char. ^KJ reformat ^KX save
^P up ^N down ^V next screen ^KK end ^Y line ^T options ^C abort
^Z previous word ^A beg. of line ^KM move ^W >word ^R refresh ^KZ shell
^X next word ^E end of line ^KC copy ^O word< ^@ insert FILE
SEARCH ^KU top of file ^KW file ^J >line SPELL ^KE edit
^KF find text ^KV end of file ^KY delete ^_ undo ^[N word ^KR insert
^L find next ^KL to line No. ^K/ filter ^^ redo ^[L file ^KD save
IW documents/pilotprimer.txt Row 22 Col 1 10:48 Ctrl-K H for help
Although most manufacturers tout their brand of Personal Digital
Assistant, or PDA, as the "easiest to use," or most "convenient" device,
when it comes to connecting to the Internet, novice PDA and Internet users
may still have a hard time in making that first connection to their
Internet Service Provider, or ISP. Luckily for 3Com Palm Pilot users, all
the media hype is true: You can use your PalmIII, Pilot Professional or
earlier, upgraded Pilot to send and receive electronic mail, read Usenet
news, and browse the World Wide Web.
In this article I'll show you how to configure your Pilot to connect to
Internet through an ISP, introduce you to seveal essential free Pilot
Internet programs, and will reveal some neat tips, traps and tricks on
getting the most out of your Pilot Interne t sessions. You'll find that
these handy, shirt-pocket devices require less space, weigh less, and last
longer on battery power than any laptop, and can be indispensable for
keeping connected while on the road or away from the office.

The `jed` main configuration files can be found under the `/usr/lib/jed/lib` directory, and you can customize how `jed` runs by placing preferences in a `.jedrc` file in your home directory. Copy the file `jed.rc` from the `/usr/lib/jed/lib` directory to your home directory as `.jedrc`, and then edit to your taste.

FIGURE 14.5

The `jed` *editor has built-in help and text menus you can use as a shortcut to keyboard commands.*


XJed
Menu: (0)File, (1)Edit, (2)Buffers, (3)Windows, (4)Help, (5)Misc, (6)Exit
Although most manufacturers tout their brand of Personal Digital
Assistant, or PDA, as the "easiest to use," or most "convenient" device,
when it comes to connecting to the Internet, novice PDA and Internet users
may still have a hard time in making that first connection to their
Internet Service Provider, or ISP. Luckily for 3Com Palm Pilot users, all
the media hype is true: You can use your PalmIII, Pilot Professional or
earlier, upgraded Pilot to send and receive electronic mail, read Usenet
news, and browse the World Wide Web.
In this article I'll show you how to configure your Pilot to connect to
Internet through an ISP, introduce you to seveal essential free Pilot
Internet programs, and will reveal some neat tips, traps and tricks on
getting the most out of your Pilot Interne t sessions. You'll find that
these handy, shirt-pocket devices require less space, weigh less, and last
longer on battery power than any laptop, and can be indispensable for
keeping connected while on the road or away from the office.
-**----(Jed 0.F98.4) Emacs: pilotprimer.txt (Text) 15/271,1 10:51am
JED Emacs keybindings: `^' means to use Ctrl key (e.g., ^X = Ctrl-X).
^X^C exit ^V PageDn ^Xu Undo ^X^W write to file ^A beg of line
^L redraw ESC V PageUp ^D delete ^X^F open a file ^E end of line
-%%-----(Jed 0.F98.4) Emacs: *help* () 1/4,1 10:51am
Pick a number or press Ctrl-G to abort or SPACE to go back to previous level.

The `jed` editor has built-in help, but you can find information about `jed` under the `/usr/doc/jed` directory, in its manual page, and in info files under the `/usr/lib/jed/info` directory.

Using the `kedit` Editor Client

The `kedit` editor (shown in Figure 14.6) is included with the K Desktop Environment and has numerous features, including the following:

- A menu bar supporting file, editing, options and help
- A toolbar containing buttons for the following:

  - Creating a new document
  - Email
  - Help
  - Performing copy, paste, and cut operations
  - Printing
  - Opening a file
  - Saving the current file
- Custom colors and fonts
- Insertion of the current date and time
- Retrieval of Internet documents via FTP
- Search and replace
- Sending of documents by electronic mail
- Text file insertion
- Word wrap

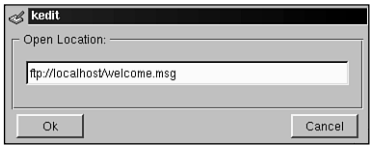


FIGURE 14.6

The `kedit` *editor has many different features, such as search-and-replace, help, custom colors, and retrieval of text documents via the Internet.*

You can test `kedit`'s remote file retrieval by creating a file called `welcome.msg` with some sample text. Copy this file to the `/home/ftp` directory (as the root operator). Next, start `kedit` by clicking the Application Starter button on your desktop's panel, then selecting the Applications menu, and clicking the editor menu item. When the `kedit` window appears, select the File menu, and then click the Open URL... menu item. A retrieval dialog box appears (as shown in Figure 14.6). Click the OK button and the text of the `welcome.msg` file is inserted into `kedit`'s editing window.

To learn how to navigate the Internet and download files using the `ftp` command, see Hour 13, "Internet Downloading and Browsing."

Using the CRiSPlite Editor

The CRiSPlite editor, included with OpenLinux, is a programmer's editor used mainly to create and edit source code for programming. This editor (an extremely limited version of the commercial editor) sports a graphical interface under the X Window system and features buttons and menus you can use while you work.

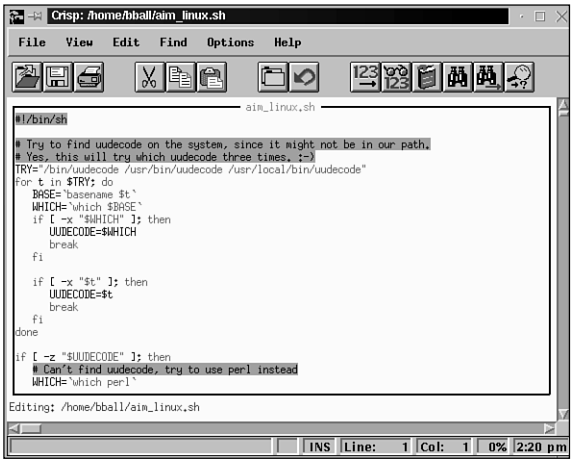
Start CRiSPlite by clicking the editor's icon on your desktop's panel if you're using the K Desktop Environment. You can also find an icon in the initial Looking Glass desktop after you start an X session with the fvwm2 window manager. Start the editor from the command line of a terminal window with the `mcr` command, like this:

```
# mcr
```

The editor appears with its window, as shown in the Figure 14.7.

FIGURE 14.7

The CRiSPlite editor for OpenLinux is mainly a programming editor.



You can also use this editor from the command line of your console with the `cr` command, like this:

```
# crg
```

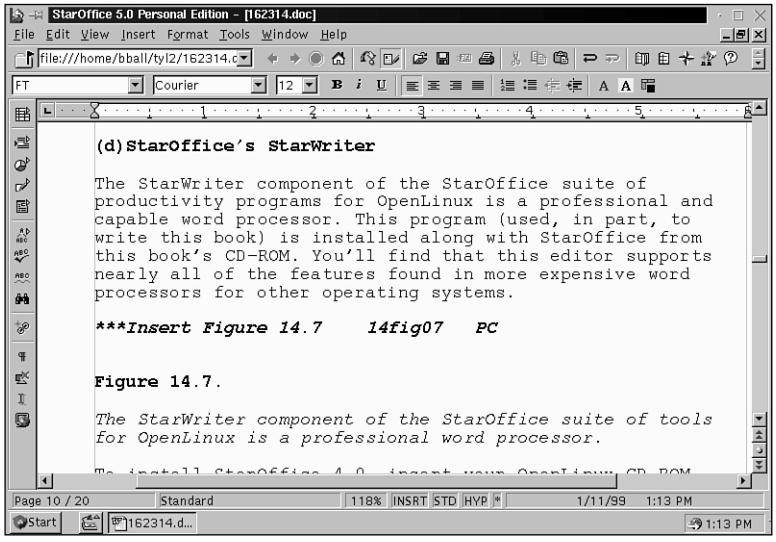
Press Enter to launch CRiSPlite without the X Window System.

StarOffice's StarWriter

The StarWriter component of the StarOffice suite of productivity programs (shown in Figure 14.8) for OpenLinux is a professional and capable word processor. This program (used, in part, to write this book) is installed along with StarOffice from this book's CD-ROM. This editor supports nearly all the features found in more expensive word processors for other operating systems.

FIGURE 14.8

The StarWriter component of the StarOffice suite of tools for OpenLinux is a professional word processor.


StarOffice 5.0 Personal Edition - [162314.doc]
File Edit View Insert Format Tools Window Help
(d)StarOffice's StarWriter
The StarWriter component of the StarOffice suite of productivity programs for OpenLinux is a professional and capable word processor. This program (used, in part, to write this book) is installed along with StarOffice from this book's CD-ROM. You'll find that this editor supports nearly all of the features found in more expensive word processors for other operating systems.
***Insert Figure 14.7 14fig07 PC
Figure 14.7.
The StarWriter component of the StarOffice suite of tools for OpenLinux is a professional word processor.
Page 10 / 20
Standard
118%
1/11/99 1:13 PM
Start
1:13 PM

To install StarOffice 4.0, insert your OpenLinux CD-ROM, and then mount the CD-ROM like so:

```
# su -c "mount /mnt/cdrom"
```

Navigate to the StarOffice installation directory on the CD-ROM, like so:

```
# cd /mnt/cdrom/Star*/english/prod_lnx
```

At the command line, use the StarOffice `setup` command to start the installation, like this:

```
# setup
```

Press Enter to start the installation.

If you receive the newer StarOffice 5.0 suite, first browse to `http://www.stardivision.com` to obtain a customer number and registration key. You need to enter your customer name, customer number, and registration key exactly as shown on the StarDivision registration page in order to install and enable StarOffice 5.0. See Hour 19, "Home Office Management with StarOffice," for more details about installing and using StarOffice.

StarOffice installs in an `Office`*`XX`* directory in your home directory, where *`XX`* represents the version of StarOffice installed (40 for 4.0 or 50 for 5.0). Start StarOffice by typing the following:

```
# Office50/bin/soffice &
```

To create a new StarWriter document, click the StarOffice Start menu (at the bottom left of the StarOffice desktop). StarWriter appears, as shown in Figure 14.8).

Corel's WordPerfect for Linux

OpenLinux is a great Linux distribution to use, and now there's an even better reason to use Linux: In December 1998, Corel, Inc. released the WordPerfect version 8 word processor for free for personal use with the Linux operating system. WordPerfect, one of the most mature and capable word processors on the market today (for any operating system) can be downloaded, installed, and used for free.

You should definitely register your copy of WordPerfect, even if you only use it occasionally. Corel, Inc. needs to have an accurate idea of the potential of the Linux software market, and your registration helps encourage development of new commercial software for Linux. Corel, Inc. is to be applauded for making this software available at little cost to the casual Linux user.

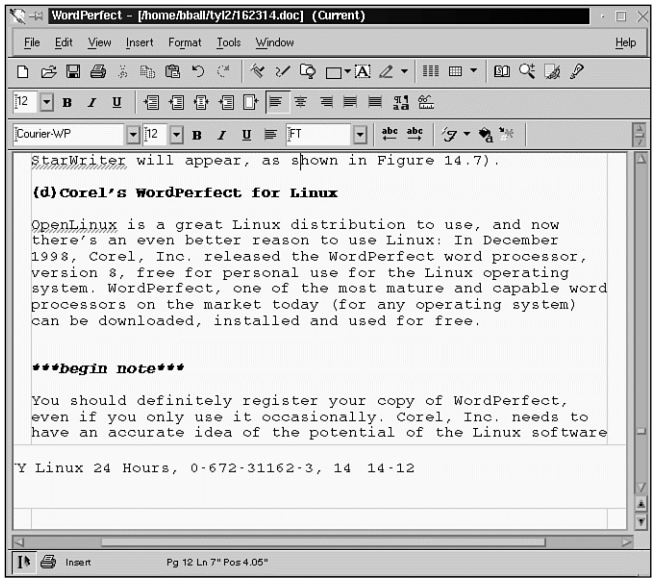
To get your copy, browse to `http://www.linux.corel.com/linux8/index.htm`. Follow the links, read the installation instructions, and then download and install the file `GUILG00` (nearly 24 megabytes in size). You can then start WordPerfect by typing the complete path to the executable file (using the installation directory specified during your WordPerfect installation), like so:

```
# /opt/wp/wpbin/xwp &
```

The WordPerfect splash screen appears, along with a control dialog box and the blank WordPerfect document window, as shown in Figure 14.9.

FIGURE 14.9

The distribution of the WordPerfect 8 word processing system for OpenLinux represents Corel, Inc.'s concerted investment and confidence in the worldwide Linux user community.


WordPerfect - [/home/bball/tyl2/162314.doc] (Current)
File Edit View Insert Format Tools Window Help
Courier-WP
StarWriter will appear, as shown in Figure 14.7).
(d)Corel's WordPerfect for Linux
OpenLinux is a great Linux distribution to use, and now there's an even better reason to use Linux: In December 1998, Corel, Inc. released the WordPerfect word processor, version 8, free for personal use for the Linux operating system. WordPerfect, one of the most mature and capable word processors on the market today (for any operating system) can be downloaded, installed and used for free.
begin note
You should definitely register your copy of WordPerfect, even if you only use it occasionally. Corel, Inc. needs to have an accurate idea of the potential of the Linux software
Y Linux 24 Hours, 0-672-31162-3, 14 14-12
Insert
Pg 12 Ln 7" Pos 4.05"

Applix Words

There are many other Linux word processing programs besides the text editors installed on your system. These programs are in the public domain, distributed as shareware, or sold commercially. One word processor, Applix Words by Applix, Inc., has many different features:

- It is an integrated part of the Applixware suite of office tools, including a spreadsheet, graphics, mail, and presentation program and supporting frames, linked objects, and pasted graphics.
- It provides a WYSIWYG view of your documents and comes with two dozen fonts.
- It imports and exports 20 different word processing file formats.
- It supports extensive editing macros.
- It includes a spelling dictionary and thesaurus.
- It includes extensive built-in and context-sensitive help.
- It creates and edits hypertext markup language, or HTML documents.
- It can be completely customized with new menus or keyboard commands.
- It builds indexes, tables, tables of contents, and glossaries.

Applix Words requires the X Window System. The Applixware suite needs about 135 megabytes of your hard drive space and 16 megabytes of your computer's memory to run comfortably. After installing Applix Words from the Applixware CD-ROM, run it with the following:

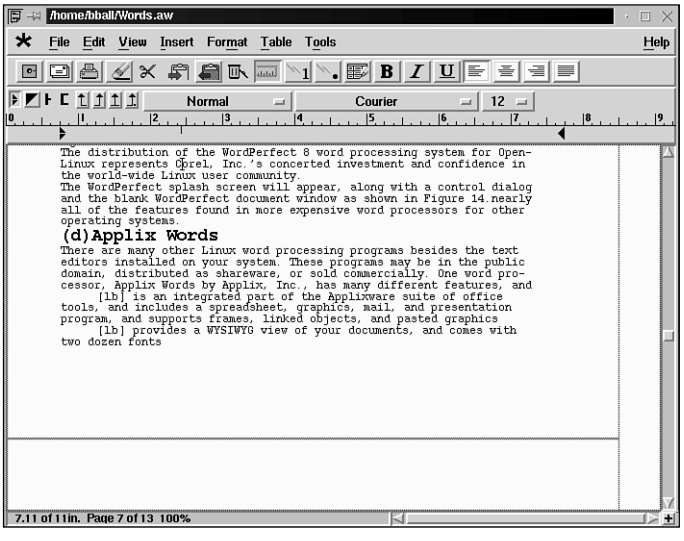
```
# applix -wp
```

The latest version of Applixware (4.4.1 at the time of this writing) has an installation and execution problem related to OpenLinux 1.3. This problem involves Caldera's use of older versions of shared software libraries. Fortunately, you can install Applixware and then configure its libraries to work with OpenLinux 1.3. First, log in as the root operator, and then navigate to the `/opt/applix/jre115/lib/i386/green_threads` directory. Use the `mv` command to rename the library file `libdl.so.1` to `libdl.so.1.dontuse`. Next, open your `.bashrc` file in your home directory, and enter this new environment variable definition: **`export LD_PRELOAD=/lib/libdl.so.1`**. Log out and log back in to OpenLinux to use the new definition. You can now use Applixware!

This command line starts the word processor component as shown in Figure 14.10. Applix Words also has a tutorial, like `emacs`. To start learning, select the Help menu, and then pull down the Tutorial menu item. (You also can hold down the Alt key, and then press H, followed by the T key.)

FIGURE 14.10

The Applix Words program is a WYSIWYG word processor including a customizable interface and professional editing tools for writers.


/home/tball/Words.aw
File Edit View Insert Format Table Tools Help
Normal
Courier
12
The distribution of the WordPerfect 8 word processing system for OpenLinux represents Corel, Inc.'s concerted investment and confidence in the world-wide Linux user community.
The WordPerfect splash screen will appear, along with a control dialog and the blank WordPerfect document window as shown in Figure 14.nearly all of the features found in more expensive word processors for other operating systems.
(d)Applix Words
There are many other Linux word processing programs besides the text editors installed on your system. These programs may be in the public domain, distributed as shareware, or sold commercially. One word processor, Applix Words by Applix, Inc., has many different features, and
[lb] is an integrated part of the Applixware suite of office tools, and includes a spreadsheet, graphics, mail, and presentation program, and supports frames, linked objects, and pasted graphics
[lb] provides a WYSIWYG view of your documents, and comes with two dozen fonts
7.11 of 11in. Page 7 of 13 100%

Find out more about Applix Words and the Applixware productivity suite for Linux by browsing to the following site:

`http://www.applix.com`.

Changing Text with `sed` and Other Filters

Until now, this hour has discussed interactive editors featuring cursor movement, menus, or other keyboard commands. There are several other programs, such as text filters, or stream editors, included with your system that can edit text.

If you read the discussion in Hour 6, "Using the Shell," you'll recall that many Linux programs can use your shell's standard input and standard output. By using shell operators, such as pipes or redirection operators, you can use Linux commands to filter text through pipelines to manipulate or change the text stream. There also are several other programs, such as `ex` and `sed`, that are specifically designed to edit filtered text and are called stream editors.

Thanks to the FSF folks, the GNU `text-utils` package of two dozen text utilities is also installed on your system. This collection includes `cat`, `cksum`, `comm`, `csplit`, `cut`, `expand`, `fmt`, `fold`, `head`, `join`, `md5sum`, `nl`, `od`, `paste`, `pr`, `sort`, `split`, `sum`, `tac`, `tail`, `tr`, `unexpand`, `uniq`, and `wc`.

Some of these formatting commands, such as `fmt` and `pr`, are discussed in the next hour, "Preparing Documents," but this section shows you how you can use several others to manipulate text. For example, the `tr`, or transliterate, command can be used to work on streams of text to translate, squeeze, or delete characters.

The `tr` command works by taking sets, or lists of characters on the command line, and using them to translate input text. If you have a document containing uppercase and lowercase but want to change the text to all uppercase, you can tell the `tr` command to do this by specifying the two sets of characters. A public domain software license (found in the `/usr/doc/shadow-misc` directory) is used in the following example:

```
# cat LICENSE
...
1.  You may make and give away verbatim copies of the source form of the
Standard Version of this Package without restriction, provided that you
duplicate all of the original copyright notices and associated
disclaimers.

2.  You may apply bug fixes, portability fixes and other modifications
derived from the Public Domain or from the Copyright Holder.  A Package
modified in such a way shall still be considered the Standard Version.
...
```

You can change this document to all uppercase with the following:

```
# cat LICENSE ¦ tr a-z A-Z
...
1.  YOU MAY MAKE AND GIVE AWAY VERBATIM COPIES OF THE SOURCE FORM OF THE
STANDARD VERSION OF THIS PACKAGE WITHOUT RESTRICTION, PROVIDED THAT YOU
DUPLICATE ALL OF THE ORIGINAL COPYRIGHT NOTICES AND ASSOCIATED
DISCLAIMERS.

2.  YOU MAY APPLY BUG FIXES, PORTABILITY FIXES AND OTHER MODIFICATIONS
DERIVED FROM THE PUBLIC DOMAIN OR FROM THE COPYRIGHT HOLDER.  A PACKAGE
MODIFIED IN SUCH A WAY SHALL STILL BE CONSIDERED THE STANDARD VERSION.
...
```

The document has been piped, using the `cat` command, through the `tr` command, specifying that you want the set of lowercase letters, from a to z, to be translated to uppercase, or A to Z. The `tr` command can also be used to translate individual characters. For example, notice that two spaces are used following each number and a period in the sample text. You can replace multiple occurrences of characters with a single character by using the `-s`, or squeeze, command-line option:

```
# cat LICENSE  ¦ tr -s " "
...
1. You may make and give away verbatim copies of the source form of the
Standard Version of this Package without restriction, provided that you
duplicate all of the original copyright notices and associated
disclaimers.
...
```

As you can see, the two spaces have been replaced with a single space. The `tr` command also filters input to other commands, such as `cut`, to quickly generate custom reports. For example, if you don't need all the information from the `ls` command's `-l`, or long, format listing and only want certain columns of the output, you can get any column you want by filtering the listing through several pipes:

```
# ls -l
...
-rw-r--r--   1 root     root         1898 Jan 29  1998 ANNOUNCE
-rw-r--r--   1 root     root        28796 Jul 23 18:13 CHANGES
-rw-r--r--   1 root     root        68500 Mar 16  1997 HOWTO
-rw-r--r--   1 root     root         5040 May  1  1997 LICENSE
-rw-r--r--   1 root     root          850 Dec 14  1997 LSM
-rw-r--r--   1 root     root        11535 May  1  1997 README
...
```

This is a lot of information, but if you only want the permissions, size, and name of each file, you can quickly generate a custom listing with the following:

```
# ls -l ¦ tr -s " " ¦ cut -d" " -f1,8,9
...
-rw-r--r-- 1998 ANNOUNCE
-rw-r--r-- 18:13 CHANGES
-rw-r--r-- 1997 HOWTO
-rw-r--r-- 1997 LICENSE
-rw-r--r-- 1997 LSM
-rw-r--r-- 1997 README
...
```

The listing now only shows the first, eighth, and ninth columns of the original listing because the `tr` command squeezed multiple spaces into a single space. The output is piped through the `cut` command, specifying a field delimiter using the `-d` option (in this case, a space). Notice that although the first and second columns look okay, the third is a little ragged. If this still isn't what you want, cut different fields or clean it up by again using the `tr` command to replace the space delimiter with a tab:

```
# ls -l ¦ tr -s " " ¦ cut -d" " -f1,5,9 ¦ tr " " '\t'
...
-rw-r--r--      1898    ANNOUNCE
-rw-r--r--      28796   CHANGES
-rw-r--r--      68500   HOWTO
-rw-r--r--      5040    LICENSE
-rw-r--r--      850     LSM
-rw-r--r--      11535   README
...
```

The listing now shows the permissions, file size, and name of each file. You can use these filters to change text in your documents, but stream editors, such as the `sed` command, offer more capable approaches to editing text from the command line. For example, the sample license document uses the phrase `this Package` to describe a software package. If you are the software developer of a new game, *Nano-Warrior*, and need to save time writing copyright licenses, you can change all occurrences of `this Package` to `Nano-Warrior` easily and quickly without using a text editor:

```
# cat LICENSE ¦ sed 's/this Package/Nano-Warrior(TM)/g'
...
1.  You may make and give away verbatim copies of the source form of the
Standard Version of Nano-Warrior(TM) without restriction, provided that
you duplicate all of the original copyright notices and associated
disclaimers.
...
```

The `sed s`, or substitute, command is used to search for all instances of the first string and replaces each instance with the second because of the `g`, or global, command. The original text file is not changed, and you can save a new version by redirecting the output.

The `sed` command also is designed to work using editing scripts. To make numerous, regular changes to files, create an editing script, and use your script to edit files. Use the `sed` command's `-f`, or script file, command-line option to use the script:

```
# sed -f myscipt.sed < form.ltr >output.ltr
```

There are too many text filters included with your OpenLinux distribution to discuss in this hour; see the manual pages for the filter commands listed near the beginning of this section. You also might want to experiment with the `wc`, or word count, program, which reports the number of characters, words, and lines in your text documents.

Spell Checking Your Documents

Misspelled words in your documents can be embarrassing, especially if other people read your text. Correct spelling is an important part of writing and word processing. Just as errors in syntax can cause programming errors, spelling errors can cause problems in miscommunication, loss of a potential job or customer, or the respect of a supervisor.

Fortunately, your Linux distribution comes with the `ispell` spelling checker, so you don't have to suffer the embarrassment of misspelling! This section shows you how to correct documents and fix your spelling errors.

Correcting Documents with the `ispell` Command

The `ispell` command, found under the `/usr/bin` directory, is an interactive spelling program you can use alone or with your text editor to correct spelling mistakes. Several editors included with your Linux distribution, such as `emacs` and `pico`, are set up to automatically use this program for spell checking, but using `ispell` by itself is easy. For example, to check the spelling of the file `myfile.txt`, use the following:

```
# ispell myfile.txt
```

The `ispell` program loads the text and then displays the first found error in context, along with a single or several suggested replacements, as in this example:

```
MERCHANTIBILITY              File: LICENSE

WARRANTIES, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF
MERCHANTIBILITY AND FITNESS FOR A PARTICULAR PURPOSE.

 0: MERCHANTABILITY
[SP] <number> R)epl A)ccept I)nsert L)ookup U)ncap Q)uit e(X)it or ?
➥for help
```

Correct the spelling by either typing `0`, the number of the suggested replacement word, or `R`, which you can use to replace the word by retyping it.

Look up other words with `L`, the lookup command, which searches the system dictionary, called `words`, located under the `/usr/dict` directory. If you use `I`, or the insert command, `ispell` creates a personal dictionary in your home directory, using `.ispell_english` as a filename.

You also can specify multiple documents on the `ispell` command line:

```
# ispell *.txt
```

This command line causes `ispell` to load each file ending in `.txt` for spell checking. If you prefer to use `ispell` as the more traditional UNIX spell command, which reads a document and then prints out a list of suspected words, use the `-l`, or list, option on the command line:

```
# ispell -l < LICENSE
...
Julianne
Haugh
uunet
uu
MERCHANTIBILITY
...
```

Note that the `<` redirection operator is used because in the `-l` mode, the `ispell` command acts as a spelling filter, checking the input text stream against its dictionary (located under the `/usr/lib/ispell` directory). You can redirect this list to a file or use the `-f` command-line option:

```
# ispell -l -f errors -a <LICENSE
```

This sends all misspelled words to the file called `errors`. The `ispell` program has 15 different command-line options. Use the `-L` option to change the amount of context, or text displayed before and after a suspected error. The `-b` option creates a backup file of your original document, which is a good idea if you make the mistake of entering a wrong correction (this is the default for your version of `ispell`).

The `ispell` package includes nine other programs you can use to build your own dictionaries or to add lists of words from your personal dictionary into the `ispell` dictionaries. For details about these programs, see the `ispell` manual page. For details about building your own dictionaries, read the `ispell` manual page under the `/usr/man/man5` directory. You can do this with the following command:

```
# man 5 ispell
```

Documentation for `ispell` is in its two manual pages and under the `/usr/doc/ispell` directory.

Single Word Lookup and Other Tricks

When all you need is quick confirmation of the spelling of a single word, you don't have to run your word processor or text editor to get the answer because you can use the `look` command, found under the `/usr/bin` directory.

Although the `look` command is normally used to search files and print all lines matching a given string pattern, the `look` command quickly looks up a word in the system dictionary. If you don't specify a file to search on the `look` command line, `look` automatically searches the system dictionary, called `words`, which is located in the `/usr/dict` directory. See the following example:

```
# look consci
conscience
consciences
conscientious
conscientiously
conscious
consciously
consciousness
```

The system dictionary, `words`, is a symbolic link to the file called `linux.words`, also located in the `/usr/dict` directory. This dictionary, a 400,000 character, plain ASCII list of sorted words, contains 45,402 words. You can find an even larger dictionary, called `web2`, which is more than two megabtyes and contains more than 234,000 words, by searching your favorite Linux Internet sites or browsing to `ftp://ftp.digital.com/pub/BSD/net2/share/dict`.

All you have to do is type several characters of the beginning of a word, and the `look` command prints any matches found in the system dictionary. You also can use the `ispell` command's `-a` command-line option to check spelling interactively or quickly look up a single word or several words at the keyboard. Lookups are performed on the `ispell` dictionary, not the system dictionary. See the following example:

```
# ispell -a
@(#) International Ispell Version 3.1.20 10/10/95
seperate
& seperate 1 0: separate

mispell
& mispell 2 0: ispell, misspell
```

```
mississippi
& mississippi 1 0: Mississippi

truncate
*
[Ctrl-d]
#
```

Notice that `ispell` starts, prints a short version message, and then waits for your input. When you enter a misspelled word, `ispell` echoes the word back and if a suggested replacement is found, prints the replacement with a number. Also note that `ispell` even corrects words spelled correctly but not properly capitalized. Finally, if you enter a correct word, `ispell` merely echoes back an asterisk. To quit, enter an end of text character by pressing Ctrl+D.

Summary

This hour introduced you to a number of word processors, editors, and text utilities for OpenLinux. You now also know how to spellcheck text documents using the `ispell` command and how to quickly look up words from the command line.

Q&A

Q **I found that I made a lot of incorrect changes to a document when using `xemacs`. I know about the `undo` command, but is there are faster way to quickly fix things?**

A The good news is the `xemacs` creates a backup file of your document. However, you can revert back to the original form of the document with the revert-buffer command. Press the Esc key, and then type the **`x`** key. At the command prompt (at the lower left of the `xemacs` window), type **`revert-buffer`**, and press Enter.

Q **Help! I can't get printing to work with WordPerfect!**

A Don't panic. See Hour 15, "Preparing Documents," for step-by-step directions on how to print with WordPerfect.

Q **I entered a misspelled word into my personal dictionary when using `ispell`. How can I fix this?**

A The personal dictionary is a simple text file. Open the file with your favorite text editor and remove or correct the word.

Q I accepted an incorrect word when using `ispell`, and the file has been written to disk! How can I fix this?

A Fortunately, `ispell` saves a copy of your original document with the extension `.bak` appended. Use the `mv` command to replace the incorrect file or to rename the backup file.

Q StarOffice 5.0 won't let me install or finish its installation after I enter my name, customer number, and personal key!

A Make sure you enter your name, customer ID and registration number exactly as entered when you registered StarOffice. You can later change your personal information through the Configuration menu.

Q I want words to wrap around in the `kedit` editing window. How do I do this?

A Select the Options menu, and then click the `kedit` Options menu item. Next, click the Set Fill-Column At button, and type in the number of characters you want to use for a line width.

Q How do I print with the CRiSPlite editor?

A Open the Setup Options dialog box and select Printer. In the Print to file field, type `¦ lpr`, and then click the Apply button.

Exercises

1. Experiment with the Search and Replace dialog box in the `kedit` editor. If you're not the root operator, try opening a text file under the `/usr/doc` directory and then saving the file with a different name. Why can't this be done?
2. Create a blank StarWriter document, and then in a separate terminal window, highlight the output of a program, such as `ls`. How should you paste the highlighted text in the StarWriter document? (Hint: You can't use the middle mouse button!)
3. Try using cut and paste operations in the `pico` editor to move different paragraphs inside a document. How do you move blocks of text with `pico`?

HOUR 15

Preparing Documents

Hour 14, "Text Processing," discussed text editing tools and programs used to create, edit, and save documents. This hour introduces you to programs and utilities used to format and print your text documents. It starts off with a discussion of different text formatting programs and shows you how to easily format your documents for printing without using complicated formatting commands. It then shows you how to use more complex programs using simple command lines.

The hour concludes with a discussion of the basics of document printing under OpenLinux, as well as detailed information about how to configure your printer to get the best possible output.

Formatting Text

Although you can do basic formatting of text documents using a text editor, most of these basic editing programs for OpenLinux lack the necessary features to add page numbering, boldfacing, font changes, indenting, or other fancy text layout.

The programs discussed in this hour are used to prepare, format, convert, and print text documents. To create professionally typeset documents with a word processor, try StarOffice's StarWriter or Corel's WordPerfect 8 for Linux. See Hour 14 to learn more about these programs.

Producing nicely typeset documents using the text utility programs included with OpenLinux is usually a three step process. First, you create the document using a text editor and intersperse your text with typesetting commands to create certain effects when you filter your document through a formatting program. The second step is to process your document through a typesetting program and produce formatted output. The third step is to either check your formatting by previewing the document or if you're confident about your formatting, to print the document.

This section shows you how to use formatting programs to produce nicely organized documents. It also discusses the basic syntax, or commands, that these programs recognize.

Formatting Text Using Text Filters

In Hour 14, you were introduced to some text filters that change the output of different programs or the contents of a document. The text filters discussed here can help you quickly format your documents if you don't want to learn a complex formatting program or use complicated typesetting commands. You can find these programs useful to quickly build formatted documents with headers, footers, margins, and page numbers.

Sending directory listings or short text files directly to your printer without formatting might be okay, but printing larger text files usually requires better formatting. One command you can use is the `pr` command, found under the `/usr/bin` directory. The `pr` command has 19 different command-line options to format documents, as shown in Table 15.1.

TABLE 15.1 COMMON *pr* COMMAND-LINE OPTIONS

Option	*Action*
`+`*x*	Begin printing at page *x*
`-a`	Print columns across the page
`-b`	Balance columns (on last page)
`-c`	Use ^c notation to make control characters visible
`-d`	Use double spacing

`-e[x[y]]`	Convert tabs (or x) to spaces, use y tab character width
`-f`, `-F`	Output form feed between pages
`-h str`	Use str as page header instead of filename
`-i[x[y]]`	Convert spaces (or x) to tabs, use y spaces in tabs
`-l xx`	Page length set to xx
`-m`	Print multiple files in parallel columns on page
`-n[x][y]]`	Use line numbers (with a following character x), and y digits for the numbers
`-o x`	Set left margin to x
`-r`	Turn off warning messages
`-s[x]`	Use character x to separate columns
`-t`	Turn off default headers and footers
`-v`	Show unprintable characters in base 8 (octal) notation
`-w xx`	Set page width to xx characters
`-x`	Format page into *x* columns

Look at the following example:

```
# pr +4 -h "Draft Number 1" -o 8 <pilotprimer.txt ¦ >output.txt
```

This command line formats the file `pilotprimer.txt`, starting at page `4`, with a header containing the date, time, page number, and the words `Draft Number 1`; the left margin is 8 spaces. Using the `>` redirection operator, the formatted output is then saved to a file called `output.txt`, which you can print at a later time.

Pipe the output through the `less` pager to preview your formatting before printing.

The `pr` program also formats selected streams of text. One handy use is to create formatted columns. For example, if you have a paragraph, you can quickly create columns of text by combining several filter programs and then formatting the text with the `-COLUMN` command-line option (a hyphen, followed by the number of columns; `-3` in the following example):

```
# cat cities.txt
Cincinnati, San Francisco, Philadelphia, Chicago, Miami, Norfolk,
Savannah, Seattle, Pittsburgh, St. Louis, Phoenix, Nashville, Las Vegas,
Atlantic City, Raleigh
# cat cities.txt ¦ sed 's/, /#/g' ¦ tr '#' '\n' ¦ sort ¦ pr -l 1 -3
Atlantic City           Chicago                 Cincinnati
Las Vegas,              Miami                   Nashville
Norfolk,                Philadelphia            Phoenix
Pittsburgh              Raleigh                 San Francisco
Savannah                Seattle                 St. Louis
```

The preceding example uses a list of cities separated by commas. By using several filters, including the `pr` command, the text is formatted as a readable list, sorted alphabetically. The command line works by first using the `sed` stream editor (discussed in Hour 14) to change each comma and space to a pound (`#`) sign. The pound sign is translated to a carriage return by the `tr` command (also discussed in Hour 14). The text, now a list of words, one per line, is fed into the `sort` command. The sorted text is fed into the `pr` command to produce three columns of text (the `-l` (or page length) option, with a value of 1, is used to inhibit the page header).

You also can use the `fmt` command with the `pr` command to change the word wrap, or width, of your text documents. The following example is part of a public-domain software license (found under the `/usr/doc/shadow-misc` directory):

```
# cat LICENSE
...
1.  You may make and give away verbatim copies of the source form of the
Standard Version of this Package without restriction, provided that you
duplicate all of the original copyright notices and associated
disclaimers.

2.  You may apply bug fixes, portability fixes and other modifications
derived from the Public Domain or from the Copyright Holder.  A Package
modified in such a way shall still be considered the Standard Version.
...
```

Although this text might be okay when printed on the screen or by using the default settings with the `pr` command, the text overruns lines if you use a left margin of 10 spaces. Look at the following example:

```
# pr -o 10 <LICENSE
...
          1.  You may make and give away verbatim copies of the source fo
rm of the
          Standard Version of this Package without restriction, provided
that you
          duplicate all of the original copyright notices and associated
          disclaimers.
```

```
          2.  You may apply bug fixes, portability fixes and other modifi
cations
          derived from the Public Domain or from the Copyright Holder.  A
 Package
          modified in such a way shall still be considered the Standard V
ersion.
...
```

The preceding example certainly doesn't look nice when printed! To fix this, use the `fmt` command to format the text with a smaller line width before formatting with the `pr` command:

```
# cat LICENSE ¦ fmt -w 60 ¦ pr -o 10
...
          1.  You may make and give away verbatim copies of the
          source form of the Standard Version of this Package
          without restriction, provided that you duplicate all of
          the original copyright notices and associated disclaimers.

          2.  You may apply bug fixes, portability fixes and other
          modifications derived from the Public Domain or from the
          Copyright Holder.  A Package modified in such a way shall
          still be considered the Standard Version.
...
```

As you can see, the text now fits nicely on your page when printed. You can also create more sophisticated effects by combining the output of `fmt` with the multiple-column option of the `pr` command. For example, to format the previous example document, `pilotprimer.txt`, use the `fmt` command to reformat the text into a thin column of 26 characters, and then send the text through the `pr` command to format the text into multiple columns, like this:

```
# fmt -26 <pilotprimer.txt ¦ pr -2 -s\¦ -o 2 -t -w 60
  HACKING THE 3COM PALM        ¦Information You Need
  PILOT PERSONAL DIGITAL       ¦to Connect
  ASSISTANT                    ¦
                               ¦There are several things
  Although most                ¦you need to know before
  manufacturers tout their     ¦you can starting web
  brand of Personal Digital    ¦browsing, Usenet news
  Assistant, or PDA, as the    ¦reading, or sending and
  "easiest to use," or most    ¦receiving email on your
  "convenient" device, when    ¦Pilot. When you signed
  it comes to connecting       ¦up for your Internet
  to the Internet, novice      ¦service, you should have
  PDA and Internet users       ¦received an information
  may still have a hard        ¦packet from your
  time in making that          ¦ISP. This information
  first connection to          ¦should include:
...
```

Not all the output is shown, but as you can see, the `fmt` command is used to convert the text stream into a 26-character wide column. This output is then fed to `pr`, which formats the text in two columns. The `-s` option is followed by a backslash (`\`) and a vertical bar (`¦`) to specify the vertical bar as a column separator. The `-o` option sets the left margin to two spaces, and the `-t` option turns off headers and footers. The `-w 60` option sets a page width of 60 characters, which is certainly suitable for most printers.

But what if you want to save paper and see at least two pages of output on a single page? In this case, use the `mpage`, or multiple page, command to print several sheets of paper on a single page. Look at the following example:

```
# mpage -2 myfile.txt >myfile.ps
```

This command line uses the `mpage` command, found under the `/usr/bin` directory, to create a PostScript file you can later print that contains the contents of the `myfile.txt` document as two side-by-side pages on each sheet of paper. To preview the PostScript file during an X11 session, use the `gv` previewer, like this:

```
# gv myfile.ps
```

You can use the `mpage` command's `-O`, `-E`, or `-R` options to print full-duplex (back-to-back) documents. This can be handy for producing small booklets using letter-size paper with a printer that's not capable of printing on both sides of each sheet. You also can set different margins, fonts, and the order of printed pages. See the `mpage` manual page for details.

Using the `fmt`, `pr`, or `mpage` commands, along with other text filters, you can perform quick and dirty rudimentary text formatting. If you want to try more complex formatting, use a text formatting program.

Formatting Text with the `groff` Formatter

If you've used OpenLinux for the past several hours and have read some manual pages, you're probably familiar with at least one complex formatting program: `groff`. When you read a manual page with

```
# man ls
```

it is equivalent to the following:

```
# nroff -man /usr/man/man1/ls.1 ¦ less
```

NEW TERM Notice that the `nroff` command is used on the command line instead of `groff`. This is because the `nroff` command installed on your system is a shell script, written to use the GNU `groff` formatting program to emulate the `nroff` command. All OpenLinux man pages are written using a special set of `nroff` commands called *man macros*. You can use the `groff` command to use man macros to format your own manual pages. For example, if you create a manual page for a new game called `nw`, the manual page, called `nw.6`, might look like the following:

```
.TH Nano-Warrior 6  Games 1/1/98 Linux
.SH NAME
nw - play Nano-Warrior
.SH SYNOPSIS
nw
.B -d
.PP
-d = play deathmatch mode
.SH DESCRIPTION
.PP
The nw command is used to play a game of Nano-Warrior on your Linux
console. Play continues until you are wiped out by hordes of alien
invaders swarming down the screen.
.PP
Don't give up the fight!
.SH FILES
/usr/games/nw
.PP
$HOME/.nw_scores
.SH BUGS
Probably too many.
```

You can process this manual page and send it to your display with the following:

```
# groff -Tascii -man nw.6
Nano-Warrior(6)               Linux               Nano-Warrior(6)


NAME
       nw - play Nano-Warrior

SYNOPSIS
       nw -d

       -d = play deathmatch mode

DESCRIPTION
       The  nw  command is used to play a game of Nano-Warrior on
       your Linux console. Play continues until you are wiped out
       by hordes of alien invaders swarming down the screen.

       Don't give up the fight!
```

```
FILES
       /usr/games/nw

       $HOME/.nw_scores

BUGS
       Probably too many.
```

Notice that the man page macros boldface the sections and format the following text automatically. A list of these and other manual page macros are found in the `man.7` manual page under the `/usr/man/man7` directory. You can read this manual page with the following:

```
# man 7 man
```

The `groff` formatting program also comes with other sets of typesetting macros, such as the `me`, `mm`, or `ms` manuscript macros used to format text files. You generally need to specify the macro set on the `groff` command line if you use these commands:

```
# groff -Tascii -mm myfile.txt
```

Documentation for several of these macros is on various manual pages related to `groff`. One of the best documented sets included with your OpenLinux distribution is the collection of `mm` manuscript macros on the `groff_mm` manual page. Table 15.2 lists some common macros you can use to produce formatted documents.

TABLE 15.2 COMMON *groff mm* MACROS

Action	*Macro Name*
Center justify	`.ds C`
End text box	`.b2`
Justification off	`.sa 0`
Justification on	`.sa 1`
Line fill off	`.ds N`
Line fill on	`.ds F`
New paragraph with *x* indent	`.p` *x*
No indents	`.ds L`
Right justify	`.ds R`
Start bold text	`.b`
Start text box	`.b1`
Use columns	`.mc`
Use one column	`.1c`
Use two columns	`.2c`

Some of the more common commands that don't require a macro set are listed in Table 15.3. Experiment with them to see their effect on your documents before printing.

TABLE 15.3 COMMON *groff* TYPESETTING COMMANDS

Action	*Command Name*
Begin new page	`.bp`
Begin new paragraph	.pp
Center next *x* lines	.ce *x*
Center text *x*	.ce *x*
Insert (space) *x* inches down	.sp *x*i
Insert *x* inches down	.sv *x*i
Set font bold	.ft B
Set font roman	.ft R
Set line spacing to *x*	.ls *x*
Temporary indent *x* inches	.ti *x*i
Turn off line fill	.nf
Turn on centering	.ce
Turn on indenting *x* inches	.in *x*i
Turn on line fill	.fi
Underline next *x* lines	`.ul` *x*

When you're ready to produce a formatted document, use the `groff` command's `-T` command-line option to produce a document in several different document formats. The `groff` formatter produces PostScript, TeX `dvi` (discussed next), text, HP printer-control language, or PCL formats. Look at the following example:

```
# groff -Tascii -mm myfile.txt >myfile.txt
# groff -Tps -mm myfile.txt >myfile.ps
# groff -Tdvi -mm myfile.txt >myfile.dvi
```

You can preview these documents before printing by using several different programs, such as `gv` for PostScript (`.ps`) or `xdvi` for `dvi` files (`.dvi`).

The `gv` program is discussed in Hour 16, "Graphics Tools."

Formatting Text with TeX

The TeX typesetting system, originally by Donald E. Knuth, is a collection of programs and other utilities used to produce professionally formatted documents. It is a much more sophisticated system than the `groff` distribution and includes more than 65 programs, along with such related support files as libraries, macros, fonts, and documentation.

If you install TeX on your system with the `lisa` or `rpm` commands, you need at least 30 megabytes for the main distribution, 10 megabytes for a series of related macros called LaTeX, and eight megabytes for 50 different fonts. Obviously, describing the entire system and how to use each different program in the TeX system is beyond this hour. But this section shows you how to get started with a sample document.

Previewing TeX `dvi` documents requires a preprocessing step that can take several minutes before the pages are even displayed. Files must first be processed by the `MakeTeXPK` program, and related processes can eat up your system resources. A much better approach is to convert the file to PostScript with the `dvips` command, found under the `/usr/bin` directory with the following:

```
dvips -f < texdoc.dvi >tex.ps
```

Now use the `gv` program with `gv tex.ps` to read the file.

You can find documentation for TeX in a variety of places. You can read the manual pages for related files, check the `/usr/info` directory for TeX information files, and browse to the `/usr/TeX/texmf/doc` directory. There are 10 different directories of documentation files, but the easiest way to read about your TeX distribution is to use the lynx Web browser with the following:

```
# lynx ls /usr/TeX/texmf/doc/index.html
```

The TeX distribution files are displayed in an organized list that you can browse through to download sample files and guides directly to your home directory. Beginning users should definitely read the TeX Frequently Asked Questions (FAQ) document.

Like the `groff` program, TeX uses formatting commands inserted in your text files to manipulate how your file looks when printed. You create your file, insert appropriate commands or macros to format text, and then process your document through TeX to create an output file, usually in `dvi` format, that you can preview or print.

To see a sample of TeX using the LaTeX macros, try processing a sample file in the TeX directories:

```
# latex  /usr/TeX/texmf/doc/generic/pstricks/samples.tex
```

This creates a file called `samples.dvi`. First, convert the file to PostScript with the `dvips` command, like this:

```
# dvips -f <samples.dvi >samples.ps
```

You see quite a bit of output from this command. When the command finishes, use the `gv` client to preview the `sample.ps` document, like so:

```
# gv samples.ps
```

You can use TeX to produce complex diagrams and text, but you have to make the effort to learn TeX first!

There are many different macros and macro sets included with the TeX formatting system. Covering the details of complex formatting is beyond the scope of this book, but you're encouraged to experiment, starting with simple commands, to get a feel for typesetting documents. There are nearly 100 books about using TeX on the market. If you're serious about learning how to use TeX, a good book is indispensable.

Printing Text Documents

After you finish formatting your text files, using either a series of filters or inserted typesetting commands, you can print your file to produce a typeset hard copy. To control the printing of your documents, you need to understand how OpenLinux handles printing and how to start, stop, cancel, and control the printing process.

There are several printing commands you can use to control the printing process on your system. This section first shows you how your printer is described under OpenLinux and where the important printer files are located. Because most OpenLinux users at home have a parallel printer attached to their computers, this hour's discussion is limited to parallel printers.

Printers are known as character mode devices and are listed under the `/dev` directory. Look at the following example:

```
# ls /dev/lp*
/dev/lp0 /dev/lp1 /dev/lp2
```

This shows the three parallel printer devices that are installed on your system by default.

Serial printers are serial devices and have names such as `/dev/ttySX`, where `X` is a number from 0 to 3 (similar to your modem ports). Read the `setserial` command's manual page to learn how to set your serial port to the fastest baud rate your printer supports. Read Grant Taylor's Printing-HOWTO under the `/usr/doc/HOWTO` directory for additional pointers on using serial printers.

To determine if your printer is working, first make sure your printer is plugged in, attached to your computer's parallel port, and turned on. Next, boot OpenLinux, and log in. For a clue about which printer parallel port and printer device are used, pipe the output of the `dmesg` command through the `less` pager, and look for output similar to the following:

```
lp1 at 0x0378, (polling)
```

Then, using the specified device (in this case, `lp1`) try sending a directory listing to your printer with the following:

```
# ls >/dev/lp1
```

You might also hear your printer activate or reset as OpenLinux boots and loads the `lp.o` parallel printer kernel module.

If you specified the right printer device, your printer activates and prints the current directory list. If nothing happens, try looking at any listed devices in the OpenLinux process directory, like so:

```
# cat /proc/devices
```

See if the printer device driver was loaded or compiled in your kernel. You see something like the following:

```
Character devices:
...
 6 lp
...
```

If you don't see an `lp` device listed, make sure that the parallel printing `lp.o` module is listed in the OpenLinux module file (with the pathname returned by `uname -r` and `uname -v` commands) under the `/etc/modules` directory.

Printing Documents with the LPRng Printing System

If you installed a printer during the initial Linux installation process, you can find your printer defined in the /etc/printcap file. This file is an ASCII database of your system's local and network printers and describes the capabilities of each printer.

OpenLinux uses Patrick Powell's line printer spooling system, named LPRng, which is an updated and improved version of the lpr spooling system used by other Linux distributions. It features networking and security enhancements. When you first boot, OpenLinux starts lpd, the line printer daemon. The lpd program runs in the background, waiting for printing requests. You start a printing request with the lpr command:

```
# lpr mydocument.txt
# lpr myfile.ps
```

This command line spools, or sends, your documents to a file in the /var/spool/lpd directory. You also can use the lpr command as a printing filter to print outgoing streams of formatted text:

In general, files sent to your printer are converted to PostScript according to a set of configuration rules in files called *print filters* under the /var/spool/lpd/lp directory. Under OpenLinux, your printer is designated as a PostScript printer (with the name ps), which enables a wide variety of UNIX and Linux programs to work transparently to print your documents.

```
# groff -Tascii -mm myfile.txt ¦ lpr
```

This command line sends the output of the groff formatting program through the line printer spooler. You also can spool multiple files and then track your print *jobs*, or printing requests, by using the lpq command. See the following example:

```
# lpr mes.txt
# lpr test.txt
# lpq
Printer: ps@presario
 Queue: 2 printable jobs
 Server: pid 797 active
 Unspooler: pid 798 active
 Status: printed all 16543 bytes at 14:30:05
 Rank   Owner/ID                Class Job  Files           Size Time
active  bball@presario+796          A  796 (stdin)        16543 14:30:05
2       bball@presario+804          A  804 kdmfix.txt      1500 14:30:10
```

The output of the `lpq` command in the preceding example shows that there are two jobs created by the user `bball` for the printer `ps@presario`. If you don't want to print various spooled files, use the `lprm` command to remove a waiting print job. For example, to delete the print job for the `kdmfix.txt` document in the preceding example, use the following:

```
# lprm 804
```

You also can (as the root operator) disable or enable printers or reorder jobs with the `lpc` command. When you start `lpc` by itself on the command line, you see a prompt like this:

```
# lpc
>
```

This command has built-in help. To see a list of commands, use a question mark (`?`), like this:

```
# lpc
> ?
usage: %s [-A] [-Ddebuglevel] [-Pprinter] [-V] [command]
 with no commands, reads from stdin
  -A           - use authentication
  -Pprinter    - specify printer
  -V           - increase information verbosity
  -Ddebuglevel - debug level
 commands:
 abort   (printer[@host] ¦ all)  - stop server
 disable (printer[@host] ¦ all)  - disable queueing
 debug   (printer[@host] ¦ all) debugparms - set debug level for printer
 enable  (printer[@host] ¦ all)  - enable  queueing
 hold    (printer[@host] ¦ all) (name[@host] ¦ job ¦ all)* - hold job
 holdall (printer[@host] ¦ all)  - hold all jobs on
 kill    (printer[@host] ¦ all)  - stop and restart server
 lpd [HUP]  - get LPD PID, signal it to reread printcap and configuration
 lpq (printer[@host] ¦ all) (name[@host] ¦ job ¦ all)*     - invoke LPQ
 lprm (printer[@host] ¦ all) (name[@host]¦host¦job¦ all)*  - invoke LPRM
 move printer (user¦jobid)* target - move jobs to new queue
 noholdall (printer[@host] ¦ all)  - hold all jobs off
 printcap (printer[@host] ¦ all) - report printcap values
 quit                            - exit LPC
 redirect (printer[@host] ¦ all) (printer@host ¦ off )*   - redirect jobs
 release  (printer[@host] ¦ all) (name[@host] ¦ job ¦ all)* - release job
 reread                          - LPD reread database information
 start   (printer[@host] ¦ all)  - start printing
 status  (printer[@host] ¦ all)  - status of printers
 stop    (printer[@host] ¦ all)  - stop  printing
 topq    (printer[@host] ¦ all) (name[@host] ¦ job ¦ all)* - reorder job
 lpc>
```

Documentation for your OpenLinux printing system can be found in various man pages of the LPRng software distribution and under the /usr/doc/LPRng directory. Table 15.4 lists the major components and programs used.

TABLE 15.4 PRINT SPOOLING SYSTEM UTILITIES

Name	*Description*
lpc	The line printer control program
lpd	The line printer daemon
lpd.conf	Description of the LPRng configuration file
lpd.perms	Description of the LPRng permissions control file
lpf	A printer filter (used in printer definition files)
lpq	Show the printer spool queue
lpr	Start print jobs
lpraccnt	Printer accounting information utility
lprm	Delete print jobs from the spool queue
monitor	Log information from the lpd daemon

Configuring Your Printer with the `lisa` Command

Installing, changing, or deleting local printers with your OpenLinux system is a snap thanks to the Linux Installation and System Adminisration utility called lisa. This program is located under the /bin directory. This program can be used with or without the X Window System to set up your printer so you can print from the command line or through various X11 clients.

Because lisa is a system administration tool, you have to make sure you're the root operator and then type the following at your console or terminal command-line to configure your printer:

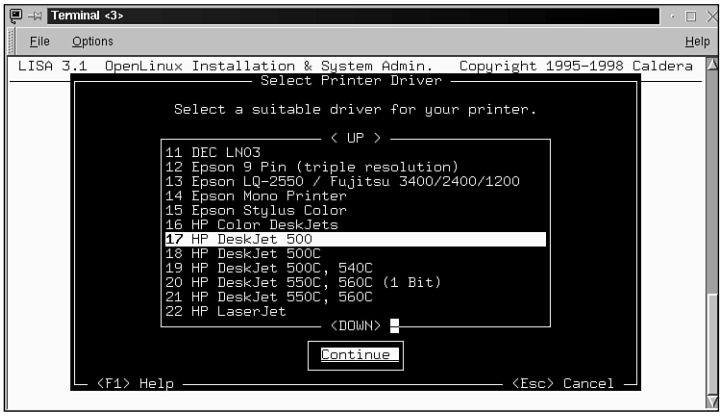
```
# lisa --printer
```

The screen clears, and you see a dialog box, as shown in Figure 15.1.

This dialog box lists nearly 40 different printers. Scroll through the list, and then pick a printer that matches your printer (or has the same capabilities).

FIGURE 15.1

The `lisa` *program provides an easy-to-use interface when you need to configure a printer for OpenLinux.*

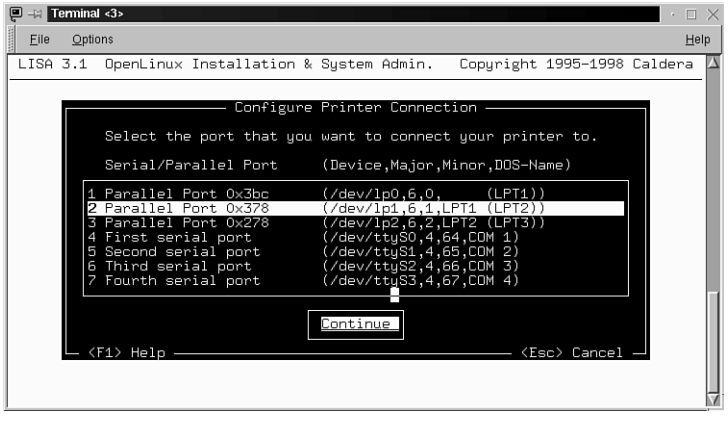

Terminal <3>
File Options Help
LISA 3.1 OpenLinux Installation & System Admin. Copyright 1995-1998 Caldera
Select Printer Driver
Select a suitable driver for your printer.
< UP >
11 DEC LN03
12 Epson 9 Pin (triple resolution)
13 Epson LQ-2550 / Fujitsu 3400/2400/1200
14 Epson Mono Printer
15 Epson Stylus Color
16 HP Color DeskJets
17 HP DeskJet 500
18 HP DeskJet 500C
19 HP DeskJet 500C, 540C
20 HP DeskJet 550C, 560C (1 Bit)
21 HP DeskJet 550C, 560C
22 HP LaserJet
<DOWN>
Continue
<F1> Help
<Esc> Cancel

If you have a printer that appears to be unsupported, check Caldera System's Web site at `http://www.calderasystems.com/support/techguide.html` to see if additional support has been created for your printer. Users of Epson Stylus color printers definitely need to read about support for these printers. If you want to print over a network or install a network printer, definitely read the "Local Filter for Remote Printer" document. If you have a PostScript printer, see the document "Setting Up a Real PostScript Printer."

When you finish, press Enter. You see a dialog box (in Figure 15.2) that lists several parallel-printer ports. Scroll through the list, pick your computer's parallel port, and press Enter.

FIGURE 15.2

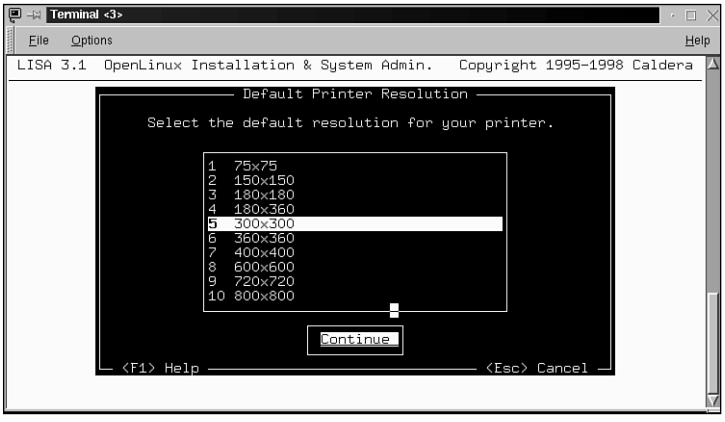
After you select your printer, `lisa` *asks you to select the appropriate parallel-printer port for your computer's printer.*


Terminal <3>
File Options Help
LISA 3.1 OpenLinux Installation & System Admin. Copyright 1995-1998 Caldera
Configure Printer Connection
Select the port that you want to connect your printer to.
Serial/Parallel Port (Device,Major,Minor,DOS-Name)
1 Parallel Port 0x3bc (/dev/lp0,6,0, (LPT1))
2 Parallel Port 0x378 (/dev/lp1,6,1,LPT1 (LPT2))
3 Parallel Port 0x278 (/dev/lp2,6,2,LPT2 (LPT3))
4 First serial port (/dev/ttyS0,4,64,COM 1)
5 Second serial port (/dev/ttyS1,4,65,COM 2)
6 Third serial port (/dev/ttyS2,4,66,COM 3)
7 Fourth serial port (/dev/ttyS3,4,67,COM 4)
Continue
<F1> Help
<Esc> Cancel

Your next step is to select the default resolution supported by your printer. This value is in horizontal and vertical dots per inch. If you're not sure about your printer, check the manufacturer's manual included with your printer. Scroll through the list of resolutions (shown in Figure 15.3), and pick one that matches your printer's capabilities.

FIGURE 15.3

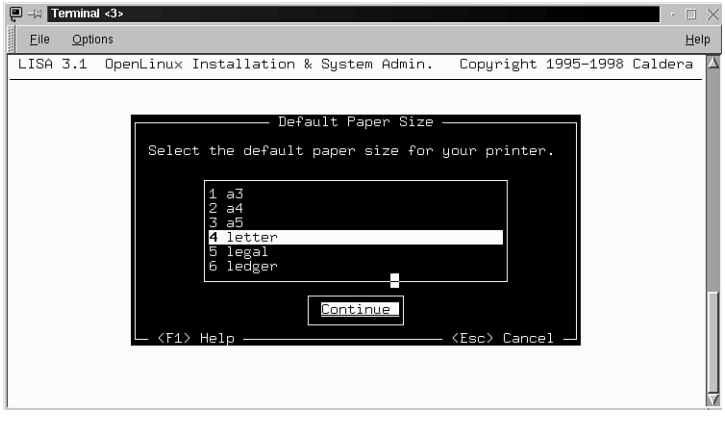
Select the proper resolution when configuring a printer for OpenLinux.



When you finish, press Enter. As the last step, you now see a dialog box asking for the default paper size used with your printer. These capabilities are all used to build and configure a proper print filter for your printer. Scroll through the list of paper sizes (shown in Figure 15.4), select the right size, and press Enter to finish configuring your printer.

FIGURE 15.4

You must also select a default paper size when you configure a printer for OpenLinux.



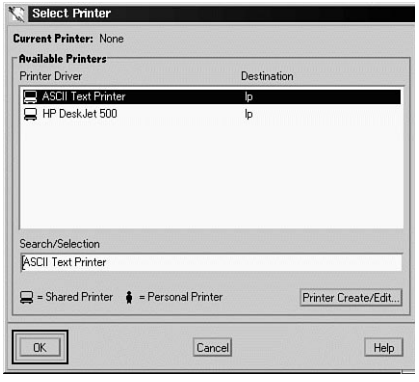
Configuring WordPerfect for Printing

If you downloaded and installed the free-for-personal-use edition of Corel's WordPerfect 8 for Linux from `http://www.linux.corel.com/linux8/index.htm`, you need to follow several steps to print. This involves adding and selecting a printer driver as the default printer.

1. Start WordPerfect, and then press the F5 key. In the WordPerfect Print dialog box, click the Select button.
2. A Select Printer dialog box appears, as shown in Figure 15.5. Click the Printer Create/Edit button.

FIGURE 15.5

The WordPerfect Select Printer dialog box is used to create or edit printers.



3. A Printer Create/Edit dialog box appears. Click the Add button.
4. An Add Printer Driver dialog box (shown in Figure 15.6) with a scrolling list of printer drivers appears. Scroll through the list, click the Passthru PostScript driver (wp60ps02.us.all), and click the OK button.
5. A tiny Create Printer dialog box appears, using the name `passpost.prs`. Click the OK button.
6. The Printer Create/Edit dialog box reappears with the Passthru PostScript printer highlighted. Click the Setup button.
7. A Printer Setup dialog box appears, as shown in Figure 15.7. Near the bottom of the dialog box, click the Destination button.

FIGURE 15.6

Select the Passthru PostScript WordPerfect printer driver to create a printer for OpenLinux.

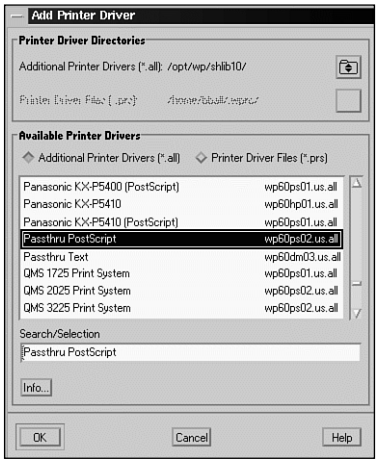
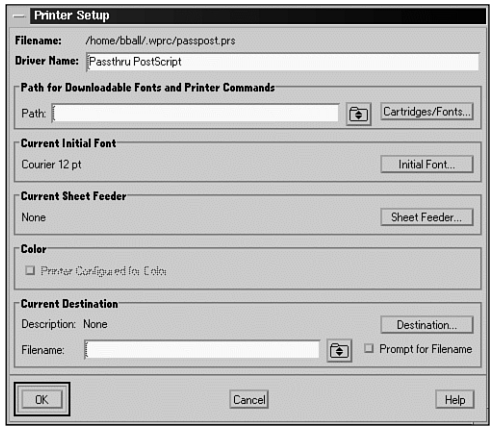


FIGURE 15.7

In the Printer Setup dialog box, click the Destination button in the Current Destination section to select a document destination.



8. A Select Destination dialog box appears (as shown in Figure 15.8), listing $PRINTER, Disk, lp, and ps. Click ps, and then click the OK button.
9. In the Printer Setup dialog box, click the OK button. In the Printer Create/Edit dialog box, click the OK button. In the Select Printer dialog box, click the OK button. You're now at the main Print dialog box. Click OK to print the current document or Cancel to cancel the printing operation. (You won't lose the new printer you created.)

If you set up printing to work correctly under OpenLinux before starting these steps, you can now print WordPerfect documents to your printer!

FIGURE 15.8

In the Select Destination dialog box, you complete your printer setup.

Summary

This hour details some of the programs you can use to format and prepare text documents for printing. You also learned a little about some of the more complex typesetting systems included with OpenLinux. Finally, you learned how to start, list, and control print jobs from the command line. You also learned how to create and configure a printer to use with OpenLinux.

Q&A

Q What other formatting utilities are included with OpenLinux?

A There are quite a few, especially for converting text file documents to PostScript. Try using the `enscript` command to convert text documents, and then read about the `eqn` utility for formatting equations for typesetting, the `pic` command for typesetting pictures from text, and the `makeindex` command for creating document indexes.

Q What other typesetting systems are included with OpenLinux?

A Read the man pages for the `amstex` system, which uses macros to extend the power of the TeX system. Another system, named `latex`, is included with OpenLinux.

Q Typesetting using these macro languages seems tedious! Is there an easier way to create these documents?

A Try using the Lynx editor. This is a quasi-What-You-See-Is-What-You-Get editor that creates documents styled similarly to `latex`.

Q I try printing, and the `lpr` command responds with an error like "connection to ps@localhost.localdomain failed—Network is unreachable"! What's going on?

A Make sure that your `/etc/hosts` file contains a definition for the loopback device and local host. Also, make sure that you do not have any incorrect hostname definitions in the file.

Exercises

1. Try printing several files and then removing remaining jobs from the print queue.
2. Use `lisa` to try to reconfigure your printer to use a higher resolution. What happens?
3. Create your own man page using several of the man macros. Try using the `nroff` script and the `groff` program. Which works better?

HOUR 16

Graphics Tools

This hour introduces a variety of graphics programs and utilities for OpenLinux. I'll start with a short discussion of different graphics formats used with OpenLinux and then show how you can convert graphics using filter programs and other graphics utilities. These programs are useful for creating, editing, and translating graphics imported from other computer programs or operating systems.

You can find a treasure trove of great graphics programs on this book's CD-ROM, and you're likely to be impressed with their usefulness and versatility. At the end of this hour, you'll be able to translate nearly any type of graphics file and perform sophisticated operations to transform your graphic files.

Understand Linux Graphics File Formats

There are many different types of graphics file formats, and examples of several types are installed in your system. You might already be familiar with several different formats, especially if you've used other computer operating systems. However, if OpenLinux is new to you, expect to run into graphics files in formats you've never seen before.

Many graphics file formats can be recognized by the file name's extension, or letters following a period in the file name. For example, you might recognize `.GIF`, `.PCX`, `.TIF`, or `.JPG` as common extensions. More than 5,000 graphics are installed on your computer if you do a full installation of OpenLinux!

Table 16.1 lists numerous graphics formats, along with relevant conversion programs included on your system. Read on to learn how to convert a graphics image from one format to another.

TABLE 16.1 LINUX GRAPHICS FORMATS AND CONVERSION PROGRAMS

Format	*Type*	*Conversion Program*
.10x	Gemini 10X	pbmto10x
.3d	Red/Blue 3D pixmap	ppm3d
.asc	ASCII text	pbmtoascii
.atk	Andrew Tookit raster	atktopbm
		pbmtoatk
.avs	AVS X image	convert
.bie	Bi-level image expert	convert
.bg	BBN BitGraph graphics	pbmtobbnbg
.bmp	Windows, OS/2 bitmap	bmptoppm
		cjpeg
		convert
		gimp
		ppmtobmp
		xv
.bmp24	Windows 24-bit bitmap	convert
		xv
.brush	Xerox doodle brush	brushtopbm
.cgm	Computer graphics metafile	convert
.cmu	CMU window manager bitmap	cmuwmtopbm

Format	*Type*	*Conversion Program*
		pbmtocmuwm
.dcx	ZSoft Paintbrush	convert
.ddif	DDIF image	pnmtoddif
.dib	Windows bitmap image	convert
.dxb	AutoCAD database file	ppmtoacad
		sldtoppm
.dvi	TeX printer file	dvips
		dvilj4
		dvilj4l
		dvilj2p
		dvilj
.eps2	Encapsulated PostScript Level II	convert
.epsf	Encapsulated PostScript	convert
.epsi	PostScript preview bitmap	pbmtoepsi
		convert
.epson	Epson printer graphics	pbmtoepson
.fax	Group 3 fax	convert
.fig	TransFig image	convert
.fits	Flexible Image Transport	fitstopnm
		pnmtofits
		convert
		gimp
		xv
.fpx	FlashPix	convert
.g3	Group 3 fax file	g3topbm
		g32pbm
		g3cat
		pbm2g3
		pbmtog3
.gif	Graphics Interchange	cjpeg

continues

TABLE 16.1 CONTINUED

Format	*Type*	*Conversion Program*
		giftopnm
		gif2tiff
		gimp
		ppmtogif
		convert
		xv
.gif87	Graphic Interchange	convert
		xv
.go	Compressed GraphOn	pbmtogo
.gould	Gould scanner file	gouldtoppm
.icn	Sun icon	icontopbm
		pbmtoicon
.ico	Microsoft icon	convert
.ilbm	IFF ILBM file	ilbmtoppm
		ppmtoilbm
.img	GEM image file	gemtopbm
		pbmtogem
		imgtoppm
.icr	NCSA ICR raster	ppmtoicr
.jbig	Joint Bi-level Image Group	convert
.jpeg	Joint Photographic Experts	cjpeg
	Group	djpeg
		jpegtran
		convert
		gimp
		xv
.lj	HP LaserJet data	pbmtolj
.ln03	DEC LN03+ Sixel output	pbmtoln03
.mgr	MGR bitmap	mgrtopbm
		pbmtomgr
.miff	MNG multiple-image network	convert
.mitsu	Mitsubishi S340-10 file	ppmtomitsu

Format	*Type*	*Conversion Program*
.mpeg	Motion Picture Group	convert
.mtv	MTV ray tracer	mtvtoppm
		convert
.pbm	Portable bitmap	pbm*
		convert
		xv
.pcd	Photo CD	convert
.pcl	HP PaintJet PCL	ppmtopjxl
		convert
.pcx	PCX graphics	pcxtoppm
		ppmtopcx
		convert
		gimp
		xv
.pdf	Portable Document Format	convert
		xpdf
.pgm	Portable graymap	pbmtopgm
		pgmtoppm
		ppmtopgm
		convert
		cjpeg
		xv
.pi1	Atari Degas file	pi1toppm
		ppmtopi1
.pi3	Atari Degas file	pbmtopi3
		pi3topbm
.pict	Macintosh PICT file	picttoppm
		ppmtopict
		convert
.pj	HP PaintJet file	pjtoppm
		ppmtopj

continues

TABLE 16.1 CONTINUED

Format	*Type*	*Conversion Program*
.pk	PK format font	pbmtopk
		pktopbm
.plasma	Plasma fractal	convert
.plot	UNIX plot file	pbmtoplot
.png	Portable Network Graphic	pngtopnm
		pnmtopng
		convert
		gimp
		xv
.pnm	Portable anymap	pnm*
		convert
		gimp
.pnt	MacPaint file	macptopbm
		pbmtomacp
.ppm	Portable pixmap	ppm*
		cjpeg
		convert
		xv
.ps	PostScript (lines)	pbmtolps
		pnmtops
		convert
		xv
		gimp
		gv
.psd	Abode PhotoShop bitmap	convert
.ptx	Printronix printer graphics	pbmtoptx
.qrt	QRT ray tracer	qrttoppm
.rad	Radiance image	convert
.ras	Sun rasterfile	pnmtorast
		rasttopnm
		gimp

Format	*Type*	*Conversion Program*
		xv
.rla	Alias/Wavefront image	convert (read-only)
.rle	Utah run-length encoded	convert (read-only)
		xv
.sgi	Silicon Graphics image	pnmtosgi
		sgitopnm
		convert
.sir	Solitaire graphics	pnmtosir
		sirtopnm
.sixel	DEC sixel format	ppmtosixel
.spc	Atari Spectrum file	spctoppm
.spu	Atari Spectrum file	sputoppm
.sun	Sun rasterfile	convert
		gimp
.tga	TrueVision Targa file	ppmtotga
		tgatoppm
		convert
		gimp
		xv
.tiff	Tagged File Format	pnmtotiff
		tifftopnm
		ppmtotiff
		tiff2ps
		convert
		gimp
		xv
.tiff24	Tagged file Format (24-bit)	convert
		xv
.tim	PSX TIM	convert
.ttf	TrueType font file	convert
.txt	text file bitmap	pbmtext
		convert (read-only)

continues

TABLE 16.1 CONTINUED

Format	*Type*	*Conversion Program*
.uil	Motif UIL icon	ppmtouil
		convert
.upc	Universal Product Code	pbmupc
.uyvy	16-bit YUV format	convert
.vicar		convert (read-only)
		xv
.viff	Khoros Visualization image	convert
.x10bm	X10 bitmap	pbmtox10bm
.xbm	X11 bitmap	pbmtoxbm
		xbmtopbm
		convert
		xv
.xim	Xim file	ximtoppm
.xpm	X11 pixmap	ppmtoxpm
		xpmtoppm
		convert
		gimp
		xv
.xv	xv thumbnail	xvminitoppm
.xvpic	xv thumbnail file	xvpictoppm
.xwd	X11 Window Dump	pnmtoxwd
		xwdtopnm
		convert
		gimp
		xv
.ybm	Bennet Yee face file	pbmtoybm
		ybmtopbm
.yuv	Abekas YUV file	ppmtoyuv
		yuvtoppm
		convert
.zeiss	Zeiss confocal file	zeisstopnm
.zinc	Zinc bitmap	pbmtozinc

Converting and Viewing Graphics

There are a number of ways to convert graphic files to different formats using the programs installed on your system. Several of the painting or drawing programs discussed in this hour translate graphics, and many programs in Table 16.1 also work as filters in piped commands (see Hour 6, "Using the Shell," for details) to translate graphics.

You can use different combinations of these commands to convert files. OpenLinux users, such as graphics artists or system administrators, convert files for different reasons. Artists or casual users might want to import or export graphics for use by different drawing programs. System administrators might look for a side benefit of converting graphics to save disk space. In some instances, the savings can be considerable. Look at the following example:

```
# xwd >graphic.xwd
# xwdtopnm <graphic.xwd ¦ convert - graphic.jpg
xwdtopnm: writing PPM file
# ls -l graphic.*
-rw-r--r--   1 bball    users       11003 Jan 27 14:21 graphic.jpg
-rw-r--r--   1 bball    users      851523 Jan 27 14:17 graphic.xwd
```

The first command line uses the `xwd` client to create an X11 window dump graphics file (`.xwd`) after you select a window and press your left mouse button. The window dump file is converted to `.pnm` format with the `xwdtopnm` command, and the output stream is fed into the `convert` command to create a `.jpg` graphics file. The hyphen (`-`) following the `convert` command specifies that the standard input should be used in lieu of an input filename. As you can see, the `.jpg` graphics file is more than 77 times smaller than the X11 window dump graphics file!

Results and benefits of file compression vary, depending on the size of the graphics file and compression settings. See the `convert` man page for details.

There are also many graphics programs not listed in Table 16.1 that can be used to alter graphics images. For example, the `pnmrotate`, `pnmsmooth`, and `pnmscale` commands rotate, smooth, and resize graphics images. You can use a variety of these programs to not only convert graphics, but change their appearance or orientation.

If you're using pipes to convert graphics, you also can change the images on-the-fly by applying these filter programs. For example, if you have a graphics file in `.xpm` format

but want to quickly flip it upside down and save it in `.gif` format, apply a filter program such as the `pnmflip` command:

```
# xpmtoppm penguin.xpm ¦ pnmflip -topbottom ¦ convert - penguin.gif
```

Here the file `penguin.xpm` is converted from `.xpm` format to `.ppm` format. The output of the `xpmtoppm` command is fed to the `pnmflip` command, which flips the graphics file upside down with the `-topbottom` option. The output of the `pnmflip` command is fed to the `convert` command, which reads the standard input and saves the graphics stream in `.gif` format.

Combinations of different filters achieve different effects. For other effects, see such commands as `pnmcrop`, `pnminvert`, `pnmrotate`, `pnmscale`, `pnnsmooth`, or `pnmtile`.

Not all graphics conversion programs included with your Linux distribution read the standard input and write to the standard output. Read the manual pages for any desired conversion programs before experimenting with pipes on the command line.

Preview or print the results of your conversions before discarding original files to make sure you achieve the effect you want and that the resulting graphics file does not suffer loss of image quality.

If you experiment with complex pipes, use the `convert` command, one of seven programs in the ImageMagick package (discussed later in the section "Graphics Editing with ImageMagick") for easier file conversions. This command, found under the `/usr/bin` directory, translates more than 75 different graphics file formats (even some not listed in Table 16.1).

The `convert` program normally works by recognizing different file extensions on the command line, as shown in the following example:

```
# xwd >graphic.xwd
# convert graphic.xwd graphic.tiff
```

Here, the `xwd` client is used to create an X11 window dump graphics file. The `convert` command then creates a `.tiff` file by specifying the `.tiff` extension on the second, or output, file on the command line. For details about using the `convert` command, see the `ImageMagick` and `convert` command man pages.

Graphics Editing with GIMP

You can change or manipulate graphics from the command line, but if you use X11, it's a lot more fun to interactively work with files using an image-processing program. One of the best and newest graphics tools for Linux is the GNU Image Manipulation Program, or the GIMP, by Spencer Kimball and Peter Mattis.

This capable and complex program, shown in Figure 16.1, has many features. If you've worked with commercial software image-editing programs on other operating systems (such as Adobe PhotoShop), you'll appreciate the GIMP's tools and filters. The GIMP features the following:

- 9 program operation menus
- 21 different editing tools
- 81 brushes
- 168 patterns
- 123 different plug-in filters and tools to create image effects or perform operations
- Import and export of 24 different graphics formats
- Multiple image windows, handy for cutting and pasting or multiple views of a file
- Multiple layers for each image, so that effects can be superimposed
- Multiple undo levels, handy if you make mistakes
- Six floating windows and dialog boxes for selecting tools, brushes, colors, or patterns

NEW TERM You need nearly 23 megabytes of hard drive space to install GIMP and its software libraries, support files, and related directories. The main GIMP files are installed under the `/usr/X11R6/share/gimp` and `/usr/X11R6/lib/gimp/X.X` directories, where X.X is the current version (1.0 at the time of this writing). The library directory contains GIMP's *plug-ins*, which are compiled modules run by GIMP from different menus that create effects or alter an image or image selection.

This program has 11 different command-line options (such as `-help` to show the list of options) but does not support X11 Toolkit options, such as geometry settings. When you specify a graphics file on the command line, GIMP attempts to load and interpret the file according to the file's extension. Starting GIMP is easy; simply type the following:

```
# gimp &
```

Unless you use the `--nosplash` option, you see a small window that provides details about various GIMP resource files while loading.

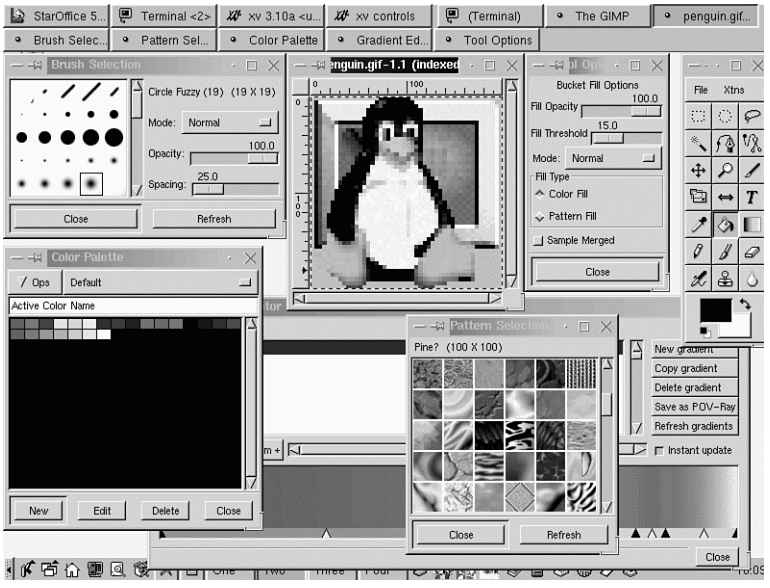


FIGURE 16.1

The GIMP image editor is an impressive X11 client with many professional features, including nearly 100 different filters for manipulating graphics.

The file `gimprc` under your `.gimp` directory can contain settings for default brushes, patterns, palettes, and temporary directories. This file is initially empty, but you can copy the default systemwide `gimprc` file and then edit the various settings according to your needs. Table 16.2 lists some common settings you can change. For example, to create your own copy in your home directory, use the following:

```
# cp /usr/X11R6/share/gimp/gimprc $HOME/.gimp/gimprc
cp: overwrite `.gimp/gimprc'? y
```

If you edit large image files, you can quickly run out of disk space because GIMP initially uses 10 megabytes of system memory and creates large temporary files during editing sessions (this is not unusual, as even commercial image editing applications typically require swap storage three times larger than system memory). If you have a separate hard drive with a lot of room, change the swap path (which is not the same as your Linux swap partition!) setting in the `gimprc` file to point to a directory on that drive. If you're really tight on memory and hard drive space, you can uncomment the `stingy-memory-use` option in your `gimprc` file. Open `gimprc` with your favorite text editor, delete the pound sign (#) in front of `stingy-memory-use`, and then save the file. On the other hand, if you have a lot of system memory, change the tile-cache size to force GIMP to use less swap space and run faster.

Your `.gimp` directory is searched first for available default brushes, tools, patterns, and other settings. Customize how GIMP runs by copying the defaults from the various `/usr/X11R6/share/gimp` directories into your home directory.

TABLE 16.2 COMMON GIMP RESOURCES SETTINGS AND DEFAULTS

Name	*Value*	*Description*
allow-resize-windows	off	Automatic resizing of window during image resize
default-brush	19fcircle.gbr	Default brush
default-gradient	German_flag_ smooth	Default gradient
default-palette	Default	Default palette
default-pattern	wood2.pat	Default pattern
dont-auto-save	off	Autosaving is not functional in GIMP 1.0
dont-confirm-on-close	off	Disable image close without saving
dont-show-rulers	off	No initial display of rulers
dont-show-tool-tips	off	Disable help text
install-colormap	off	Color setting for 8-bit displays
ruler-units	pixels	Measurement in inches, centimeters, or pixels
stingy-memory-use	off	Setting for small memory systems
swap-path	~/.gimp	Swap file location
temp-path	~/.gimp/tmp	Temporary file location
tile-cache-size	10m	Default cache (in megabytes)
undo-levels	5	Number of available Undo steps

When GIMP is running, you can tear off different dialog boxes and windows by using the dialog menu item under the GIMP File menu. If you have an active image window, access the complete GIMP menu system by pressing your right mouse button while the cursor is over your image. The various menus cascade, and you can select the file, edit, or other menu operations by dragging your cursor through the menus. Common editing keys are listed in Table 16.3.

TABLE 16.3 COMMON GIMP KEYBOARD COMMANDS

Action	*Key*
Clear selection	Ctrl+K
Close file	Ctrl+W
Copy selection	Ctrl+C
Cut selection	Ctrl+X
Fill selection	Ctrl+.
Lower layer	Ctrl+B
Merge layer	Ctrl+M
Open file	Ctrl+O
Paste clipboard	Ctrl+V
Quit	Ctrl+Q
Raise layer	Ctrl+F
Redo	Ctrl+R
Save file	Ctrl+S
Select airbrush	A
Select all	Ctrl+A
Select Bezier	B
Select blur/sharpen tool	V
Select clone tool	C
Select elliptical tool	E
Select eraser	Shift+E
Select eyedropper	O
Select fill tool	L
Select lasso	F
Select magic wand	Z
Select move tool	M
Select next tool	Tab
Select paintbrush	P
Select pencil	Shift+P
Select rectangular select tool	R
Select text tool	T

Action	*Key*
Show brushes dialog box	Ctrl+Shift+B
Show palette dialog box	Ctrl+P
Show patterns dialog box	Ctrl+Shift+P
Show rulers	Ctrl+Shift+R
Undo	Ctrl+Z
Zoom in	=
Zoom out	-

You can't find much information about the GIMP included with OpenLinux with the exception of a manual page. For the latest news and details about this program, browse to the following site:

`http://www.gimp.org`

This is the best place to find copies of the latest version of GIMP, links to GIMP Frequently Asked Questions lists, a GIMP tutorial, and new plug-ins.

Graphics Editing with ImageMagick

The ImageMagick package, by John Cristy, is a collection of seven programs you can find installed on your system. Some of these commands require the X Window System, whereas others can be used from the command line. The `convert` command has already been discussed in this hour, but you might find some of the other utilities useful when you want to manipulate graphics:

- `animate`—Displays a series of graphics; requires X11
- `combine`—Combines and overlays multiple images into a single image
- `convert`—Converts or changes graphics files
- `display`—Displays program with menus for manipulating images; requires X11
- `import`—Window capture utility; requires X11
- `mogrify`—Converts or changes and then overwrites multiple graphics files
- `montage`—Combines several graphics into a larger image

ImageMagick's `display` command has more than 75 different features and effects you can use to edit or change graphics. One interesting feature is the capability to load images into a visual directory so you can see thumbnails of all images in a directory.

Although most applications and the X11 desktop (such as the background, window frames, and program borders) look colorful, if you load and try to display a color image with lots of colors, the displaying client (such as the `display` command) reduces the number of colors used for the image if not enough colors are found in X's colormap table. This is a technical problem and limitation in X11. There are two things you can try to do: first, try to use at least 16-bit color for your X sessions (with the `-- -bpp 16 startx` option); next, see a client's man page to see if there is a private colormap option. Using a private colormap when you launch an application causes the client to display better color for its windows. The downside (which you can readily see when you use a client such as `quake.x11` or `xboing`) is that when your mouse pointer moves in the client's windows, the surrounding desktop's colors are thrown out of whack.

Using the `display` command is easy, but you must be running the X Window System. To load a graphics file from a terminal command line, type the following:

```
# display nat.jpg &
```

This loads the file and starts the program. When the graphics file loads, it is displayed in a window. Click the graphics window to see the `display` command's menu, as shown in Figure 16.2. To see a visual directory of your graphics, type the following:

```
# display 'vid:*.gif' &
```

This command line loads all `.gif` graphics in the current directory. After the program starts, access its menus by pressing the left mouse button when your cursor is over the images window. The `display` command imports and exports 58 different graphics formats. The program features built-in help and can also create slide shows of graphics.

For more information about ImageMagick, see its manual page and the manual pages for the other programs in the distribution. Comprehensive documentation is available at `http://www.wizards.dupont.com/cristy/ImageMagick.html`.

Using the `xv` Command to View Graphics

The `xv` command, shown in Figure 16.3, is a handy previewer used to review, crop, scale, edit, or convert graphics. This command offers many sophisticated sizing and color controls and more than 100 command-line options. You also can use `xv`, found under the `/usr/X11R6/bin directory`, to capture windows of your X11 session.

FIGURE 16.2

The display X11 client, part of the ImageMagick software package, can be used to make changes to many different types of graphics.

The xv client is not free software. If you use this program for commercial purposes or institutional or government use, you should send a registration fee to the author, John Bradley. Press Ctrl+A in the xv controls dialog box to see how to register.

The xv command loads a single file or series of graphics if you use a wildcard on the command line, as in the following example:

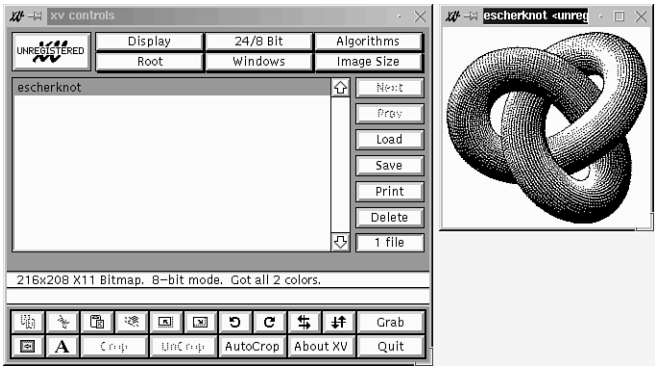
```
# xv *.jpg
```

This command line loads all files ending in `.jpg` in the current directory. After the files are loaded, scroll through a list of files to make your changes, or use a graphics directory to select your files.

The xv client does not function well on 24-bit displays. If you need to use a lot of colors during your X sessions, start X11 with 16- or 24-bit color.

FIGURE 16.3

The xv *command is an X11 client that loads, edits, captures, saves, or prints images and features sophisticated color controls.*



The xv command can import and export 18 different graphics file formats and also can print graphics. For more information about using xv, see its man page and read its definitive documentation. This file is 128 pages in PostScript format. See the next section to learn how to easily read this documentation.

Using the gv Command to View PostScript Files

The gv command is a PostScript previewer used to examine or read PostScript graphics or documents before printing. You must run the X Window System to use this program. This command, found under the `/usr/X11R6/bin` directory, is a much-improved previewer by Johannes Plass and is based on the older `ghostview` program by Tim Theilson (installed under the `/usr/X11R6/bin` directory).

The gv command (shown in Figure 16.4) has more than 36 different command-line options and uses a number of X11 Toolkit options, such as geometry settings. You can start gv by itself or specify a file on the command line, along with its options:

```
# gv -geometry 640x480 myfile.ps
```

This command line starts the gv command in a 640∞480 pixel window displaying the file `myfile.ps`.

Use the gv command to read X11 client or program documentation in PostScript format. For example, to quickly browse and read the xv documentation, use gv like this:

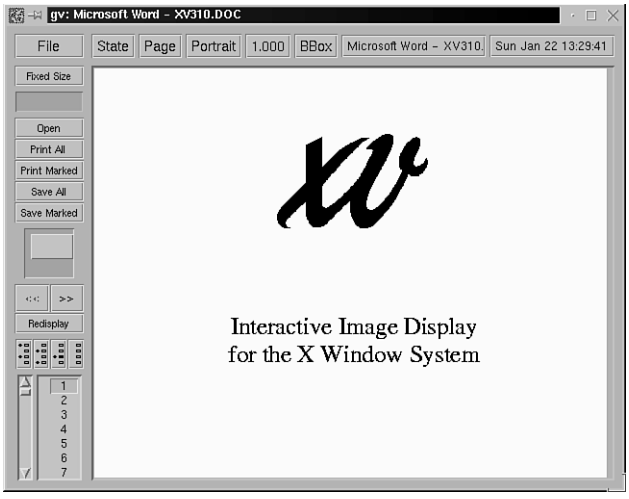
```
# gv -geometry 640x480 /usr/doc/xv-3.10a/xv.docs.ps.gz
```

The gv client reads compressed PostScript documents!

Another great feature of the `gv` command is that it reads portable document format, or `.pdf`, files. This is a handy way to read `.pdf` documents without installing an additional `.pdf` reader, such as Adobe Acrobat or `xpdf`.

FIGURE 16.4

The gv X11 client displays PostScript or PDF documents and graphics and provides an easy-to-use interface to previewing files before printing.



The `gv` command also uses a unique scrolling mechanism; instead of scrollbars alongside or below the document window, a rectangular button controls the document viewing area. You also can print whole documents or selected pages by using different commands.

You can find a comprehensive manual page, along with a hypertext series of `.html` files, under the `/usr/doc/gv` directory.

An easy way to read `gv`'s documentation is with the `lynx` or `netscape` Web browsers as in the following example:

```
# lynx /usr/doc/gv-doc-html-3.5.8/gv.html
```

A Word About Digital Cameras and Scanners

Although Linux runs on many different computers and supports many different hardware devices, the state of digital camera and scanner support is still in its infancy. Before you buy a digital camera or scanner with the express purpose of using it with OpenLinux, carefully check all Linux Internet sites for different scanning software, and then read as much documentation as possible.

You can find scanner support for many models from Nikon, Epson, Genius, Hewlett-Packard, and Mustek. Although most scanners for Linux require a Small Computer System Interface, or SCSI interface, you can find support for the Connectix series of QuickCams using your computer's parallel port or the Kodak DC20 and DC25, which use a serial-port interface. Beware: there are variations between models of scanners even from the same manufacturer, and not all models in a particular series of scanners might be supported.

The best place to check for support before buying is the SANE, or Scanner Access Now Easy Web pages. You can browse to `http://www.mostang.com/sane/` and find a tutorial on how to install the `sane` scanner drivers for OpenLinux. To help you in making a decision, Table 16.4 lists manufacturers and the number (not models) of scanners from the manufacturer that are supported.

TABLE 16.4 MANUFACTURERS AND NUMBER OF CAMERAS OR SCANNERS FOR SANE

Manufacturer	*Number of Cameras or Scanners*
Abaton	2
Agfa	8
Apple	3
Artec	4
Canon	3
Epson	1
Hewlett-Packard	11
Kodak	2
Linotype	1
Microtek	17
Mustek	7
Nikon	3
Plustek	3
Polaroid	1
Tamarack	3
Umax	19
Vobis	2

Another place to look for scanner software, documentation, and support is in the small collection of graphics application capture software packages at the following site:

```
http://metalab.unc.edu/pub/Linux/apps/graphic/capture
```

For QuickCam support, try the following site:

```
http://www.quickcam.com/developer.html
```

If you want to scan documents using the `xv` X11 client, look for the `xvscan` software at the following site:

```
http://www.tummy.com
```


Summary

This hour introduced you to graphics conversion programs for use with OpenLinux. You also learned about several X11 clients you can use to create and edit graphic files. There are many additional graphics programs included with OpenLinux, but support for scanners is still somewhat limited.

Q&A

Q What other drawing and graphics editing programs come with OpenLinux?

A The classic graphics editor included with X11 is the `bitmap` client. For editing more complex bitmaps, try the `xpaint` client. For technical drawing, such as blueprints, try the object-oriented editors `tgif` and `xfig`. However, you need a display with a resolution of at least 1024∞768 in order to use these clients.

Exercises

1. Look under the `/usr/X11R6/include/X11` directory, and then load some images from the `bitmap` and `pixmap` directories. What clients did you use?
2. Try converting a favorite graphics file into another graphics format. What programs did you use?
3. If you have a dual-boot computer running another operating system, mount the other file system and search for graphic images. What file extensions did you use as a search criteria, and how many images did you find?

HOUR 17

Learning Math and Financial Tools

This lesson is an introduction to some of the mathematical and financial tools available for Linux. This hour shows you calculators, spreadsheets, and graphic modeling programs and points you to sources where you can find even more programs. Whether you're only interested in setting up simple single-screen spreadsheets or would rather plot detailed maps using 200 megabytes of cartographic data from the U.S. Geologic Survey, you'll find Linux tools to help you get started.

The hour begins with a discussion of some calculators and calculating languages, introduces you to some of the Linux spreadsheet programs, and finishes with a discussion of modeling programs, such as `gnuplot`. This hour can't cover all the more than 1,500 scientific applications for Linux, but if you have an interest in other fields, such as artificial intelligence, astronomy, biology, chemistry, database systems, electronics, linear algebra, physics, or raytracing, you can find tools for Linux to help you.

Calculators

This section introduces you to several Linux calculators. You'll find some of these handy when you pay bills, cook, or even travel. Some of these calculators work from the command line, and others run under the X Window System.

Doing Desk Calculations with the `dc` Command

The `dc` (desk calculator) command is a command-line calculator that uses reverse Polish notation, or RPN, to perform calculations and has more than 30 different operators and internal commands. The `dc` command, found under the `/usr/bin` directory, is easy to use:

```
# dc44 55 + p
99
q
```

The example shows that to add two numbers, you first enter the numbers, then enter the operator, and then use the `p` command to print the value placed on the stack by the addition operator. The `q` command quits the `dc` program. This method of performing calculations is not as inconvenient as you might think. For example, suppose that you're going through the checks you've written during the month and that you want to check your written calculations. Using the `dc` command, you can enter the following:

```
# dc
2500.00
49.95
-
p
2450.05
32.18
-
p
2417.87
q
```

You start by entering a $2500.00 balance, and then enter $49.95 as the first check, followed by the subtraction operator (–). The `p` command prints the result, and the next current balance of $2450.05 is maintained on the *stack* (a temporary storage area in memory). You can also use the `dc` command to read files of calculations instead of typing commands at your terminal, and it has 256 different *registers*, or temporary storage areas, for your calculations. See the `dc` command's manual page for more information and other features.

Calculating with the X11 `xcalc` Client

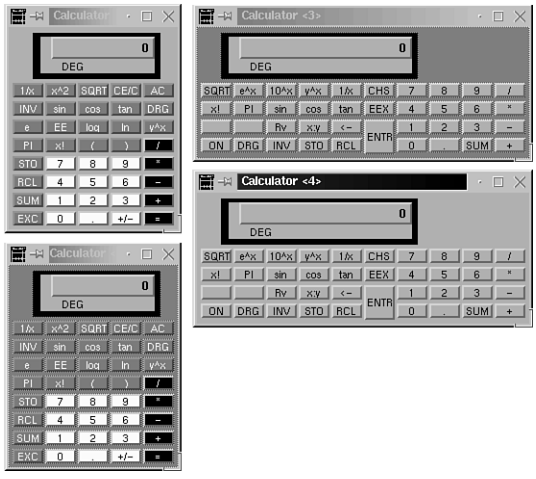
The `xcalc` client is one of the more familiar graphic calculators (see Figure 17.1) and comes with the XFree86 X Window System. The `xcalc` command, found under the `/usr/X11R6/bin` directory, has only two command-line options, `-stipple` and `-rpn`. The `-stipple` option merely colors the background of `xcalc`'s face, whereas the `-rpn` option tells the `xcalc` command to use `rpn` for doing calculations and changes its appearance.

You must be running X11 to use the `xcalc` command. You can use your mouse or the keyboard to enter numbers and perform calculations. To use it in its normal mode with the `-stipple` option, type the following:

```
# xcalc -stipple &
```


FIGURE 17.1

The `xcalc` calculator has two options that can also be used together: `-stipple` (for a mottled background) and `-rpn` (to emulate a Texas Instrument's calculator).



To use the `xcalc` command as an `rpn` calculator, type the following:

```
# xcalc -rpn -stipple &
```

You can customize nearly any aspect of `xcalc` by editing its defaults file, `Xcalc`, which is found under the `/usr/X11R6/lib/X11/app-defaults` directory. See the `xcalc` manual page for more information.

Calculating with the `kcalc` Client

The `kcalc` client, included with the K Desktop Environment, or KDE, is available through the Utilities menu on your desktop's control panel or can be started from the command line of an X11 terminal window, like this:

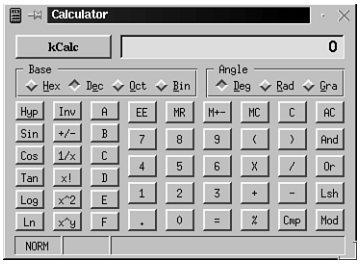
```
# kcalc &
```

After you press Enter, the `kcalc` dialog box appears as shown in Figure 17.2. To customize the `kcalc` display, click the kCalc button. A dialog box appears, as shown in Figure 17.3. To change the background and foreground colors, click the Change buttons. To change a font, click the Display Font tab.

If you need quick access to the command line but find the process of opening a terminal window tedious, use KDE's `minicli` client: press Alt+F2, and a small command-line window appears. Type in your command, such as **`xcalc`**, and press Enter. The command-line window disappears, and the X11 client runs.

FIGURE 17.2

The `kcalc` calculator performs calculations in several numerical bases.

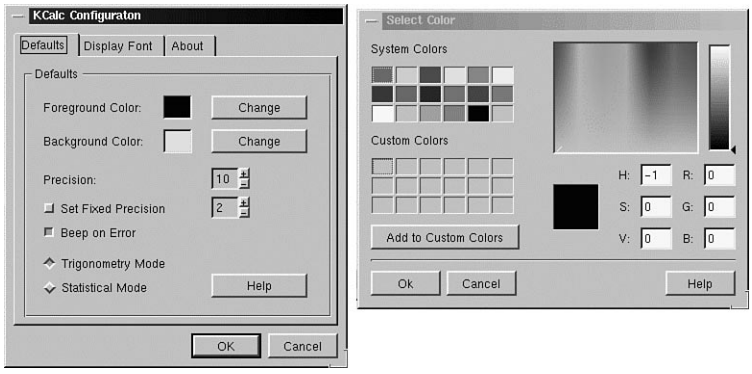


This calculator, created by Bernd Johannes Wuebben, sports a trigonometric and statistical mode and can perform calculations in base 16, 10, 8, and 2. You can use your number keys, numerical keypad, or Num Lock key to enter calculations.

The precision for base 16, 8, and 2 might be limited. Click the About tab after pressing the kCalc button for more details. You might be able to increase `kcalc`'s precision by rebuilding the program. If the source code is not included on your OpenLinux CD-ROM, you can download the source to KDE's utilities distribution through `http://www.kde.org` or one of this site's mirrors.

FIGURE 17.3

The `kcalc` *calculator's font and display can be customized.*



This calculator is also handy for performing quick conversions of numbers in different base values. To convert a number, click a base to use, enter the number, and click a different base. The number is converted automatically.

Performing Unit Conversions with the `units` Command

If you've ever had trouble remembering the formulas to convert miles to meters or cups to gallons, you'll really like Adrian Mariano's `units` command, which you can find under the `/usr/bin` directory. Want to know how many furlongs per mile? How about how many acres are in a square mile?

One way to use the `units` command is from the command line, for example:

```
# units floz gallon
        * 0.0078125
        / 128
```

This simple example shows how to find out how many fluid ounces are in a gallon. You see that there are 128 and that a fluid ounce is less than one hundredth of a gallon. Although using the command line is handy for quick conversions, you can also run a series of queries, as follows:

```
# units
501 units, 41 prefixes

You have: mile*mile
You want: acre
        * 640
        / 0.0015625
You have: mile2
You want: acre
        * 640
```

```
        / 0.0015625
You have: mile^2
You want: acre
        * 640
        / 0.0015625
You have: mile
You want: furlong
        * 8
        / 0.125
You have: 100 fathoms
You want: feet
        * 600
        / 0.0016666667
...
```

In the interactive mode, you can ask `units` for any number of conversions. The `units` command works by reading its database of conversions from the file `/usr/share/units.dat`. You can also copy this file to your home directory and add your own custom conversions to it. As you can see, you can use different notations to indicate amounts to be converted. Another interesting feature is that `units` can also perform currency conversions, for example:

```
# units dollar yen
        * 107.52688
        / 0.0093
```

Note that this might not be entirely true, as currency values change daily. You can edit the `units.dat` file and insert not only current currency values, but also prices for gold, silver, platinum, or pork bellies. See the `units` manual page for more information.

Programming Calculators with the `bc` Language Interpreter

The `bc` command is an interpreter for a calculator language. You can use this command, by Philip Nelson, to write calculator programs while `bc` is running or have `bc` run the program after it starts. The `bc` language has nearly 40 operators, functions, and programming logic keywords. Although this section doesn't go into how to program in `bc`, if you're interested in the `bc` language, try the simple checkbook balancing program from `bc`'s manual page. The program can work like the previous example for the `dc` command. Read the `bc` manual page, and then type the program into a file using your favorite text editor. You can run it with the following:

```
# bc nameofyourfile
```

The bc command starts by reading in the program in the file **nameofyourfile** and presents the following:

```
...
Initial balance? 2500.00

current balance = 2500.00
transaction? 49.95
current balance = 2450.05
transaction? 32.18
current balance = 2417.87
transaction?
...
```

This is only one way to use the bc command's language. With a little effort, you can write your own programs. If you need to perform more complex calculations, use a spreadsheet application. The next section discusses the variety of spreadsheets for Linux.

Spreadsheets

Spreadsheet programs offer a convenient way to store and manipulate financial or scientific data. You can use these programs to help manage your home or business. Typical uses involve personal finance, such as tracking loans and investments, or running business inventory control, personnel worksheets, or accounting tasks.

You can also use these programs to do forecasting, or "what if" calculations. This can help you create estimates you can use for home mortgages, auto loans, and even home construction. You're limited only to your imagination with most of these programs, and many not only offer the capability to work as a whiz-bang calculator, but also create graphic charts so you can visually see your data.

Several of these programs are on your CD-ROM. After you connect to your ISP (see Hour 10, "Connecting to the Internet"), you can use the Lynx Web browser or Netscape Navigator to search for other spreadsheet or financial programs. If you need to have a spreadsheet program to use with OpenLinux, you're in luck because at least a dozen are available. Nearly half come with source code, so you can make changes, add features, or fix problems. Recent releases of free-for-personal-use spreadsheets are as feature rich as many commercial programs costing lots of money.

Using the Public Domain sc Spreadsheet

The sc (spreadsheet calculator) command (see Figure 17.4) is a freely available, public domain spreadsheet program. This program is a collective work of nearly 60 programmers, and runs on many different UNIX systems. With a little effort in learning its commands, you can build very capable spreadsheets. The sc program is free, and it comes with source code. A short tutorial and manual page documenting its features is included.

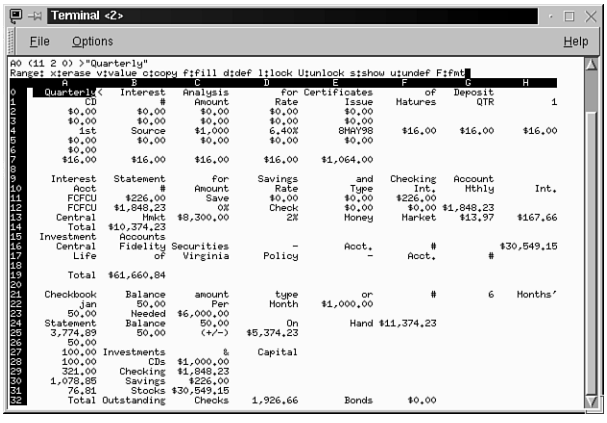
This program is especially handy if you're running OpenLinux on a small hard drive and disk space is at a premium. The `sc` program requires only about 120 kilobytes of disk space but provides a lot of features.

Using the `sc` program is easy. You can load programs from the command line when you start it, or you can load and save programs while it's running. You can run this program as follows:

```
# sc
```

FIGURE 17.4

The sc spreadsheet calculator works with or without the X Window System, and it comes with a short tutorial.


Terminal <2>
File Options Help
A0 (i1 2 0) >"Quarterly"
Range: x:erase v:value c:copy f:fill d:def l:lock U:unlock s:show u:undef F:fmt
Quarterly
Interest Analysis for Certificates of Deposit
CD # Amount Rate Issue Matures QTR 1
$0.00 $0.00 $0.00 $0.00 $0.00
$0.00 $0.00 $0.00 $0.00 $0.00
1st Source $1,000 6.40% 8MAY98 $16.00 $16.00 $16.00
$0.00 $0.00 $0.00 $0.00 $0.00
$0.00
$16.00 $16.00 $16.00 $16.00 $1,064.00
Interest Statement for Savings and Checking Account
Acct # Amount Rate Type Int. Mthly Int.
FCFCU $226.00 Save $0.00 $0.00 $226.00
FCFCU $1,848.23 0% Check $0.00 $0.00 $1,848.23
Central MMkt $8,300.00 2% Money Market $13.97 $167.66
Total $10,374.23
Investment Accounts
Central Fidelity Securities - Acct. # $30,549.15
Life of Virginia Policy - Acct. #
Total $61,660.84
Checkbook Balance amount type or # 6 Months'
jan 50.00 Per Month $1,000.00
50.00 Needed $6,000.00
Statement Balance 50.00 On Hand $11,374.23
3,774.89 50.00 (+/-) $5,374.23
50.00
100.00 Investments & Capital
100.00 CDs $1,000.00
321.00 Checking $1,848.23
1,078.85 Savings $226.00
76.81 Stocks $30,549.15
Total Outstanding Checks 1,926.66 Bonds $0.00

If you want a quick reference to the `sc` commands, use the `scqref` command (found under the `/usr/bin` directory) and pipe the output through the `nroff` and `less` commands. Then either read at your leisure or redirect to a file you can edit and print, for example:

```
# scqref ¦ nroff -man ¦ less > scref.txt
```

To learn how to use the `sc` spreadsheet program, load the `sc` program's tutorial, which you can find under the `/usr/doc/sc` directory:

```
# sc /usr/doc/sc*/tutorial.sc
```

This runs `sc` and loads the tutorial. An included program, called `psc`, can help you import text-only data files by converting word processor or other spreadsheet program files. For example, to prepare exported spreadsheet text for input to `sc`, use the `psc` command like this:

```
# psc <mysheet.txt >mysheet.psc
```

The `sc` program has more than 60 built-in functions, and because you get the source code, you can add your own.

Using the `slsc` Spreadsheet

The `slsc` spreadsheet calculator command (see Figure 17.5) is an improved version of `sc`. This program sports many new features such as improved menus, the use of color (with the `-C` command-line option), a resource file for customizing colors and keys, improved printing support, and information hiding.

Like `sc`, the `slsc` program is free and comes with source code. A short tutorial and manual page documenting its features is included. You can use this program with or without the X Window System.

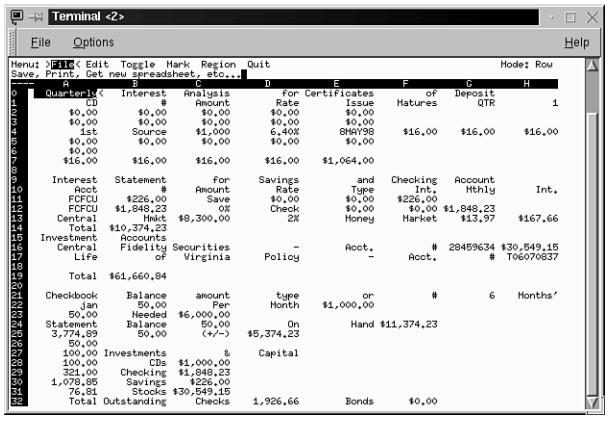
You can load programs from the command line when you start `slsc`, or you can load and save programs while it's running. To start this program with color, type the command as follows:

```
# slsc -C
```

For color support in X11, you must start `slsc` in a color-capable terminal window. You can also customize the default, systemwide settings by copying the file `slsc.rc` to your home directory with the name `.slscrc`. Then edit this file in your favorite text editor to change the settings.

FIGURE 17.5

The `slsc` spreadsheet calculator is an improved version of `sc` and also works with or without the X Window System.


Terminal <2>
File Options Help
Menu: Edit Toggle Mark Region Quit Mode: Row
Save, Print, Get new spreadsheet, etc...
Quarterly Interest Analysis for Certificates of Deposit
CD # Amount Rate Issue Matures QTR 1
Interest Statement for Savings and Checking Account
Acct # Amount Rate Type Int. Mthly Int.
FCFCU $226.00 Save $0.00 $0.00 $226.00
FCFCU $1,848.23 0% Check $0.00 $0.00 $1,848.23
Central Mmkt $8,300.00 2% Money Market $13.97 $167.66
Total $10,374.23
Investment Accounts
Central Fidelity Securities - Acct. # 28459634 $30,549.15
Life of Virginia Policy - Acct. # T06070837
Total $61,660.84
Checkbook Balance amount type or # 6 Months'
Jan 50.00 Per Month $1,000.00
50.00 Needed $6,000.00
Statement Balance 50.00 On Hand $11,374.23
3,774.89 50.00 (+/-) $5,374.23
50.00
100.00 Investments & Capital
100.00 CDs $1,000.00
321.00 Checking $1,848.23
1,078.85 Savings $226.00
76.81 Stocks $30,549.15
Total Outstanding Checks 1,926.66 Bonds $0.00

To learn how to use the `slsc` spreadsheet program, load the `slsc` program's tutorial, which you can find under the `/usr/lib/slsc` directory:

```
# slsc /usr/lib/slsc/tutorial.sc
```

This runs `slsc` and loads the tutorial. An included program, called `vprint` (included under the `/usr/lib/slsc` directory) can be used to print spreadsheet files. For more information, see the `slsc` man page, various files in the `/usr/lib/slsc` directory, and documentation under the `/usr/doc/slsc` directory.

If you like `sc` or `slsc` but want to try other spreadsheet programs for OpenLinux, look for the `oleo` spreadsheet, which is included on this book's CD-ROM. You might also want to try the X11 `xspread` program created by software engineering teams at the University of Wisconsin-Milwaukee. This program requires that you're running X11, but offers mouse support, the capability to import Lotus 1-2-3 format files, and can generate and display line, bar, stacked-bar, and pie chart graphics from spreadsheet data. Look for this program at `ftp.cdrom.com` in the `/pub/linux/slackware_source/xap/xspread` directory.

Another alternative spreadsheet is the `teapot` (table editor and planner) spreadsheet program by Michael Haardt. This spreadsheet works under X11 or your console, and features import of `sc` and `.WK1` (one of the old Lotus formats) spreadsheet files, export of CSV, HTML, LaTeX, or ASCII file formats, three-dimensional spreadsheets, support of custom keyboard function keys, great documentation, and availability in German, English, or Dutch language versions. You can get a copy at: `ftp://cantor.informatik.rwth-aachen.de/pub/unix/teapot-1.0.3.tar.gz`.

Finding the Free `Wingz` Spreadsheet

The `Wingz` spreadsheet, from Investment Intelligence Systems Corporation, is a freeware spreadsheet program for OpenLinux. This program, which comes in two versions, requires more than six megabytes of hard drive space when installed. `Wingz` has nearly any feature you could need in a spreadsheet program, including a built-in scripting language called HyperScript. You can use HyperScript to build custom interfaces and programs to present your spreadsheet data. There isn't much documentation, but there are some impressive example sheets you can load and examine, and `Wingz` has built-in, context-sensitive help.

You can generate many different types of 3D graphics, and spreadsheets can be linked or previewed before printing. To read more about `Wingz`, browse to `http://www.wingz-us.com`. To get a free copy, go to `http://metalab.unc.edu/pub/Linux/apps/financial/spreadsheet`.

Features of the `StarCalc` Spreadsheet Program

The `StarCalc` spreadsheet program (see Figure 17.6) is part of the free-for-personal-use StarOffice suite of programs for OpenLinux. This spreadsheet program is integrated with the other StarCalc applications. You can copy, paste, or use spreadsheet data and graphics as linked objects, like those for Applixware.

This is a capable program with all the features of a commercial title. Like all other programs in the StarOffice suite, `StarCalc` has print previews, 3D graphics, and drag-and-drop cell movement.

If you're using StarOffice 4.0, press Ctrl+N to open the StarOffice Templates dialog box, and then scroll down the list of Categories and click on the Spreadsheets item. There are seven ready-made spreadsheet documents you can use. If you're using StarOffice 5.0, press Ctrl+N to open the Templates dialog box, and then scroll down and select the Financial Documents item. There are six different specialized spreadsheets, such as a Household Budget, a Stock Portfolio, and a Car Financing document.

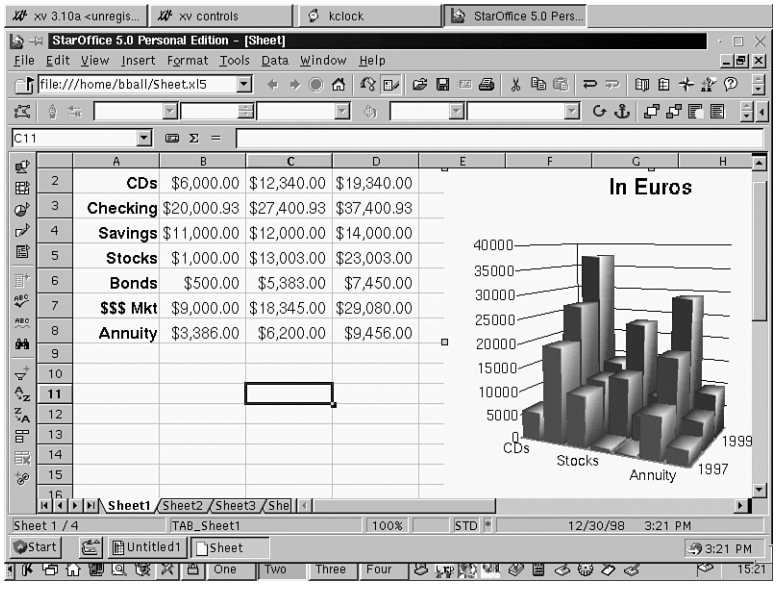


FIGURE 17.6

The `StarCalc` spreadsheet, like Applix Spreadsheets, has style sheets and mouse-driven toolbars and supports multiple ways of viewing spreadsheet data graphically.

You can import and export many different types of spreadsheet formats, as shown in Table 17.1.

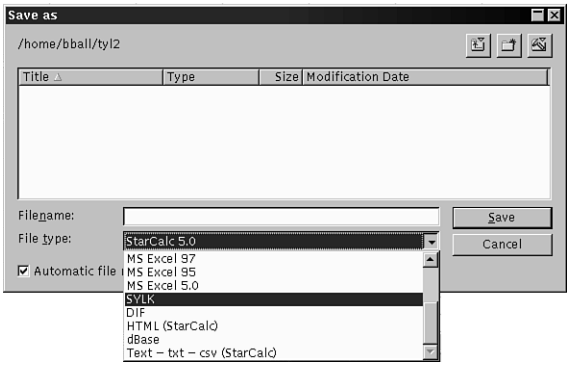
TABLE 17.1 `StarCalc` SPREADSHEET IMPORT AND EXPORT FORMATS

Import	*Export*
MS Excel 4, 5, 95, 97	MS Excel 5, 95, 97
Lotus 123 DOS/WIN	
DIF	DIF
CSV	CSV
SYLK	SYLK
dBase	dBase
text	text

To import a spreadsheet document into `StarCalc`, use the Open menu item from the `StarCalc` File menu. To export a spreadsheet document, use the Save As menu item from the File menu. A dialog box appears as shown in Figure 17.7. Click the drop-down menu next to the File type field, and a scrolling list of file types appears. Scroll through the list, and click the desired format. To save the file, click the Save button.

FIGURE 17.7

The `StarCalc` *spreadsheet can export documents in 13 different formats.*



Find out more about the StarCalc spreadsheet program by browsing to `http://www.stardivision.com`. Also see Hour 19, "Home Office Management with StarOffice" for more detailed information about how to use StarOffice and `StarCalc`.

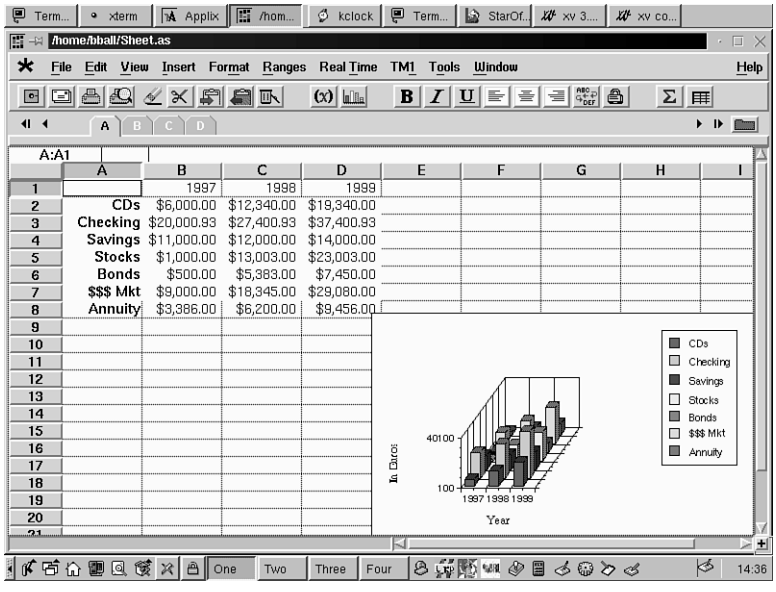
Commercial Features of the Applixware Spreadsheet Program

The Applixware spreadsheet program (see Figure 17.8) is part of the commercial Applixware suite of 10 programs for Linux (see Hour 14, "Text Processing," for more information). This spreadsheet program is integrated with the other Applixware programs using linked objects. This means that if you change the data in your spreadsheet file, the data or chart used in a word processing document also changes.

As you might expect with a commercial program, this spreadsheet offers all the features of competing titles. Besides such features as integration with the other programs in its suite, print previews, or 3D graphics, this spreadsheet program has drag-and-drop cell movement, multiple views, and numerous database functions.

FIGURE 17.8

The Applixware spreadsheet has style sheets and mouse-driven toolbars and supports multiple graphics.



You can import and export many different types of spreadsheet formats, as shown in Table 17.2.

TABLE 17.2 APPLIXWARE SPREADSHEET IMPORT AND EXPORT FORMATS

Import	*Export*
XLS	XLS3, XLS4, XLS5
WKS, WK1, WK3, WK4	WK1, WK3
DIF, XDIF	DIF
CSV	CSV
SYLK	SYLK
Text	Text

You can find out more about the Applix spreadsheet program by browsing to `http://www.applix.com`.

Using `gnuplot` to Graph Mathematical Formulas

This section shows you how to use `gnuplot`, an interactive plotting program by Thomas Williams and Colin Kelley. This program supports nearly 40 different printers and output devices, although you'll probably want to experiment with `gnuplot` using the X Window System and print your graphics using PostScript (see Hour 15, "Preparing Documents," for more information on how to do this).

Although `gnuplot` (no relation to GNU software, but supported and distributed by the Free Software Foundation under the GNU General Public License) is not the only mathematical modeling and plotting program available for Linux, it is included on your CD-ROM. You can find the `gnuplot` program under the `/usr/bin/X11R6` directory.

The `gnuplot` program (see Figure 17.9) is a complete, interactive plotting program and was originally designed to graph math functions and data. In this regard it is somewhat similar to other commercial formula-interpretation and plotting programs. It can read and save files and has built-in help, so you can query the program while you use it.

Using `gnuplot` is simple. The program has five different command-line options (such as `-mono` or `-gray` to force monochrome or grayscale plots, and `-clear` and `-tvtwm` to clear the window first or place the window relative to the desktop), but many aspects of the program can be controlled interactively or as commands in a loaded `gnuplot` data file. One common use of the command line option is to control the point size (in pixels) of drawing lines using the `-pointsize` option, as in the following example:

```
# gnuplot -pointsize 2
```

You can use and plot many types of mathematical expressions, and according to the `gnuplot` documentation, any C, Pascal, Fortran, or BASIC language mathematical statement can be used. For example, start the program at the command line of an X11 terminal window like this:

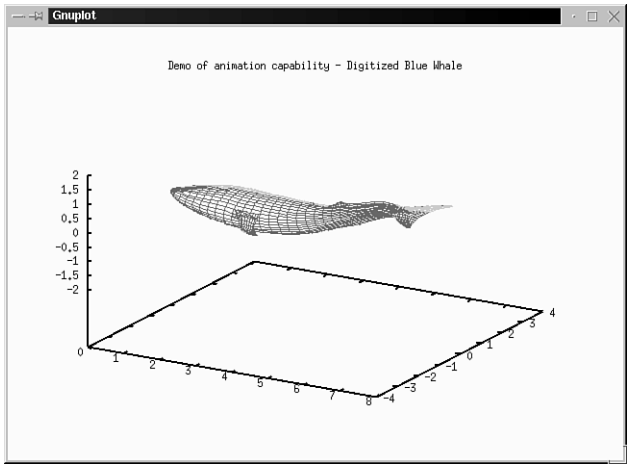
```
# gnuplot
```

After you press Enter, type in some variable values, such as the following:

```
gnuplot> y = -5
gnuplot> x = 8
```

FIGURE 17.9

The `gnuplot` program can help you visualize mathematical formulas, spreadsheet data, and yes, even whales.



To plot an expression, such as `(x*y)-(x+y)`, use the `plot` command, followed by the expression, like so:

```
gnuplot> plot (x*y)-(x+y)
```

After you press Enter, a new `gnuplot` window appears with a graphic of your expression. When you finish, type `quit` at the `gnuplot` prompt to exit the program. To load and plot sample datafiles, change directory to `/usr/X11R6/lib/gnuplot/demo`. Then, to display the data (as shown in Figure 17.9), use `gnuplot` followed by the name of a demo file, like this:

```
# gnuplot animate.dem
```

After you press Enter, you see a picture of the digitized whale, which starts swimming around the plot area of the `gnuplot` window. You can find more documentation, the `gnuplot` FAQ, and updates to the `gnuplot` program at `http://www.cs.dartmouth.edu/gnuplot_info.html`.

Many, many different financial and math applications are available for Linux. This hour barely scratches the surface. You can find financial applications that can help you manage investment portfolios, track stock prices, or aid in developing cost estimates for construction projects. You can also find hundreds of specialized programs you can use in solving special computing needs for other sciences. One of the best sites for perusing some of the best of these applications is `http://SAL.KachinaTech.COM`. You can also find a number of financial tools for Linux, along with source code, at `http://metalab.unc.edu/pub/Linux/apps/financial`.

Summary

This hour introduced you to a number of calculators and financial tools available for OpenLinux. Most of these programs are included on this book's CD-ROM.

Q&A

Q I tried running the `bc` and `dc` calculators, but the shell returns "`bash: dc: command not found`".

A Use `lisa`, `glint`, or `kpackage` to install the programs. Look under the `Scientific/Math` package folders.

Q What other calculators, scientific programs, or math utilities are included with OpenLinux?

A If you're interested in other advanced programmable calculators with a built-in programming language, try the `gp` command. Another language-type calculator is the `yorick` interpreter, which features syntax similar to BASIC or Lisp and includes an interactive graphics package for plotting results. Other programs include the following:

- `rasmol` This program is for viewing molecular graphics
- `felt` This program is for finite element analysis, which includes a CAD-like companion X11 client named `velvet`
- `xmgr` This X11 client can generate high-quality visualizations of complex data.
- `mxp` and `xfractint` These clients for X11 compute and display fractal images.

Q I tried using StarOffice 5.0's File menu to create a new spreadsheet document, but can't find these types of files listed!

A This used to be possible with StarOffice 4.0. If you're using StarOffice 5.0, click the Start menu button in the lower left corner of StarOffice's desktop, and then scroll up and click Spreadsheet to create a new spreadsheet document.

Q I tried running the `gnuplot` demo, but it stopped with an error after showing several plots. What happened?

A There's an error in the one of the plot files. Try running the demo plots separately.

Exercises

1. Start `gnuplot` and try plotting your own math expressions.
2. Copy a spreadsheet file from another operating system or application, and try importing the data into StarCalc. Experiment with importing and exporting different formats. What formats work best?
3. Start the `dc` calculator. Enter two 10-digit numbers, then an asterisk, and then the P key. What happens?
4. Compare the `sc` and `slsc` spreadsheet calculators. How are these programs similar? In what ways are they different?

HOUR 18

Personal Productivity Tools

In this hour I'll show you some calendars, commands, and X11 clients you can use to help your personal productivity. Whether it's keeping a diary or creating reminders, you'll learn how to use these tools under OpenLinux to keep you on track and on schedule with your life.

Each program or technique discussed in this hour can be accomplished with software you'll find on the CD-ROM that comes with your book. After reading this discussion, you'll find additional ways to use these programs to craft your own set of tools and techniques for personal productivity.

Scheduling Personal Reminders and Tasks with the `at` Command

If you need to keep track of important schedules, set reminders, or run programs unattended, you can use the `at` command. This command, found under the `/usr/bin` directory, schedules commands, or jobs, to be run at a time you specify. For example, if you are working on a project but need to remember to catch your car pool, you can enter a quick `at` job from the command line.

> Your system should enable you to use the `at` commands by default. If it does not, see Hour 24, "Using Scheduling to Automate System Management," on how to enable `at` command facilities for your system.

For example, to send a pop-up reminder to your screen at the appropriate time, use the following:

```
$ at 16:15
at> xmessage -display :0.0 "The car pool is leaving in 15 minutes."
at> <EOT>
warning: commands will be executed using /bin/sh
job 12 at 1998-12-18 16:15
```

This tells the `at` command to run the `xmessage` program to display the text of your message about your car pool on the specified X11 display, as shown in Figure 18.1. The end-of-text (EOT) in the listing means you should press Ctrl+D to close the command to enter the job. If you make a mistake in the syntax of the command, you receive a mail message at the scheduled time. The `-display` command-line option tells the `xmessage` command which screen to show the message on, usually 0.0, which you can find with the following:

```
# printenv ¦ fgrep DISPLAY
```

This command line pipes the output of the `printenv` command through `fgrep` to search your environment variables (discussed in Hour 6, "Using the Shell") for the value of your `$DISPLAY` environment variable.

You can also use the `at` command to provide a visual reminder, if you're using X11, by controlling the color of your desktop, for example:

```
# at 16:15
at> xsetroot -display :0.0 -solid Red
at> xmessage -display :0.0 "The car pool is leaving in 15 minutes."
at> <EOT>
warning: commands will be executed using /bin/sh
job 14 at 1998-12-18 16:15
```

FIGURE 18.1

The `at` command can be used to run any OpenLinux program or X11 client, such as xmessage, as a reminder.

This turns your desktop, or root display, a solid red color at the appointed time and then displays your message. As you can see, you can combine multiple commands to do a number of things simultaneously. If you find this approach convenient, you can also type these commands into a text file called `carpool` and run the commands by using the `-f` option, followed by the name of the file, with the following:

```
# at 16:15 -f carpool
warning: commands will be executed using /bin/sh
job 13 at 1998-12-18 10:19
```

The `at` command reads the commands from your text file and responds with a confirmation. As a further convenience, you can place this command line in your `.xintrc` script in your home directory to schedule the job after you start X11 at the beginning of the day.

See Hour 7, "Using the X Window System," for more information about configuring your `.xinitrc` file.

Use the `atq` command to see a list of all your scheduled jobs, like this:

```
# atq
14      1998-12-18 12:00 a
15      1998-12-18 13:00 a
16      1998-12-18 14:00 a
17      1998-12-18 15:00 a
18      1998-12-25 16:15 a
```

This shows that four jobs are scheduled for December 18 with another scheduled for December 25. When you schedule jobs with the `at` command, a shell script containing each command is created in the `/var/spool/atjobs` directory. The `atq` command looks in this directory for your jobs and then prints them to your display.

You can use the `at` command to schedule a job minutes, hours, days, weeks, or even years in advance. If you want to run your car pool reminder file in three hours, you can use the `at` command's plus sign (+) command-line option, for example:

```
# at +3 hours -f carpool
```

This runs your job three hours from the current system time. You can also use the time and date (in the form of *mm*/*dd*/*yy*) to schedule jobs, like so:

```
# at 16:15 12/25/00
at> xmessage -display :0.0 "The car pool is leaving in 15 minutes."
at> <EOT>
warning: commands will be executed using /bin/sh
job 21 at 2000-12-31 16:15
```

As you can see, the `at` command is Y2K-compliant! Use the `atrm` command to control your `at` jobs. You can selectively delete specific jobs by number. For example, using your job queue from the earlier example, you can type the following:

```
# atrm 16 18
```

This removes jobs `16` and `18` but leaves the other two intact. Using the `at` command is a handy way to program one-time reminders for specific times. In the next section, I'll show you how to schedule other jobs to run at regular intervals.

You can also use Rob Nation's X11 clock client, `rclock`, to schedule reminders or run programs at a selected day or time. To build a reminder, create a file called `.rclock` in your home directory, and enter reminder command lines. For example:

```
11:30 mtwtf Time for lunch!
```

This displays a reminder for lunch during the week. The `rclock` client is usually distributed with the X11 `rxvt` terminal, but does not come with OpenLinux. You can get the latest version from `http://babyaga.math.fu-berlin.de/~rxvt/`, or you can also get both `rxvt` and `rclock` in an `.rpm` file from `http://metalab.unc.edu/pub/Linux/X11/terms/`. For a diverse listing of different clocks (many with alarms) for OpenLinux and X11, browse to `http://metalab.unc.edu/pub/Linux/X11/clocks`.

Scheduling Regular Reminders with the `crontab` Command

Although the `at` command is helpful for scheduling one-time jobs, you can use Paul Vixie's `crontab` command if you need regular tasks completed at regular intervals. The `crontab` command, found under the `/usr/bin` directory, is used to enter your desired times and commands into a personal file.

The `crontab` command works by looking for `crontab` schedules by username in the `/var/spool/cron` directory. The `crontab` file for your Linux system is called `crontab` and is located in the `/etc` directory. The program that runs the system and the user `cron` schedules is the `cron` daemon, which is started when you boot Linux and wakes up each minute to check the system and user files.

To create your own `crontab` file, you must use the command's `-e` option, for example:

```
# crontab -e
```

Make sure you enable `crontab` use for your system. See Hour 24, "Scheduling" for details on how to do this. You can also define the default `$EDITOR` environment variable to your favorite text editor when you create or edit your `crontab` files. See Hour 6, "Using the Shell," on how to set environment variables, and Hour 14, "Text Processing," for information about using various text editors.

This command launches the default text editor defined in your shell's `$EDITOR` environment variable, so you can create or edit your personal `crontab` file. But before you get into the format of your `crontab` entries, think about configuring your default editor.

If your default editor is `vi` and you want to use a different editor, you can temporarily change the `$EDITOR` variable using your shell. For example, if you're using the `bash` shell and want to use the `pico` text editor, you can use the following:

```
# EDITOR=/usr/bin/pico; export EDITOR
```

This sets the default editor to the `pico` editor. You can confirm this by searching your environment variables, for example:

```
# printenv ¦ fgrep EDITOR
EDITOR=/usr/bin/pico
```

If you've never created a crontab file, you're initially presented an empty file where you can enter crontab settings, regardless of which editor you use. Before you can enter your own schedule, you need to know how to format a crontab request.

The format of a crontab entry looks like that in Table 18.1. Step values can be used in different fields, such as */3 for every three minutes or hours. Ranges can also be used, such as 7-10 for 7, 8, 9, and 10 a.m. Note that numbers (0 or 7 for Sunday) or names (the first three letters) can be used for month and day of the week fields.

TABLE 18.1 FORMAT OF A crontab ENTRY

Minute	*Hour*	*Day*	*Month*	*Day of Week*
0-59	0-23	0-31	0-12 (or names)	0-7 (or names)

You can find the format of crontab requests and some sample entries in the crontab manual page under the /usr/man/man5 directory. You can read this manual page as follows:

```
# man 5 crontab
```

Your crontab file can contain settings to start programs you want to run at regular and even not so regular times, for example:

```
* * * * * somecommand
0,15,30,45 * * * * somecommand
0 * * * * somecommand
```

The first example shows you want to run a program every minute. The second crontab entry runs a program every 15 minutes. The third example runs a program once an hour, on the hour.

To run a program once a day at an appointed time, you can use the following:

```
30 7 * * * somecommand
30 0  * * * somecommand
15 16 * * * somecommand
```

The first example runs at 7:30 a.m. The second example runs at 30 minutes past midnight. The third example runs at 4:15 p.m. each day. You can also run a program on a specific day of the month or the week, for example:

```
30 16 1 * * somecommand
30 15 * * mon somecommand
```

The first example runs at 4:30 p.m. on the first day of each month, and the second runs at 3:30 p.m. each Monday. To round out these examples, you can also specify a particular month, for example:

```
30 7 25 12 * somecommand
```

This example runs the command at 7:30 a.m. on each Dec. 25. The commands you specify can be system utilities or even your own shell scripts. You can use the `crontab` command's `-l` (list) option to print your `cron` settings, for example:

```
# crontab -l
# DO NOT EDIT THIS FILE - edit the master and reinstall.
# (/tmp/crontab.XXXXa02274 installed on Fri Dec 18 13:20:49 1998)
# (Cron version -- $Id: crontab.c,v 2.13 1994/01/17 03:20:37
➥vixie Exp $)
0,30 * * * * /usr/local/bin/saytime
0 8 * * * /usr/local/bin/ppp on
3 8 * * * /usr/bin/fetchmail -u bball -p mypasswd staffnet.com
```

This shows a `crontab` file that speaks the time every half hour, starts a PPP connection at 8 a.m. every day, and downloads the day's mail three minutes after the PPP connection starts. You can remove your `crontab` file with the `crontab` command's `-r` (remove) option, for example:

```
# crontab -r
```

Using the `crontab` command is an easy way to create, run, and manage regular tasks. Even though you can create your own reminders, you might want to use a calendar for short- or long-range planning.

Creating Appointment Reminders with the X11 `ical` Client

You can use Sanjay Ghemawat's `ical` calendar to store appointments and reminders in a personal calendar. The `ical` client, found under the `/usr/X11R6/bin` directory, has a number of unique features and improvements over the `cal` or `gcal` calendar printing programs:

- Custom graphical X11 interface with menus, dialogs, sliding controls, and buttons
- Copy and paste, drag-and-drop notes, and appointments
- Alarms for upcoming events
- Multiple calendar views
- Import, export, and autosaving of calendar files

- Group sharing of calendar files
- Printing of different calendars
- cron-type scheduling of appointments, notes, or reminders
- To-do checklists
- Built-in help

When you first run ical, the program shows the current month, set to the current day, along with a note, or appointment entry list, on the right. Start ical by using its -calendar option, followed by the name of a calendar file you want the program to create, like this:

```
# ical -calendar $HOME/.calendar &
```

This starts ical, which then creates a calendar file named .calendar in your home directory.

Unless you define an environment variable named CALENDAR that points to an ical-calendar file, you need to specify what calendar file to use every time you start ical (it periodically complains with an error message if it cannot open a calendar file). To define your CALENDAR environment variable, open your .bashrc file with a text editor and add the following:

```
export CALENDAR=$HOME/.calendar
```

Now save the file. To use this value right away, use the bash shell's source command, like so:

```
source .bashrc and press Enter.
```

The ical client also uses many of the standard X Toolkit command-line options, so you can start the ical client as an icon, for example:

```
# ical -iconic
```

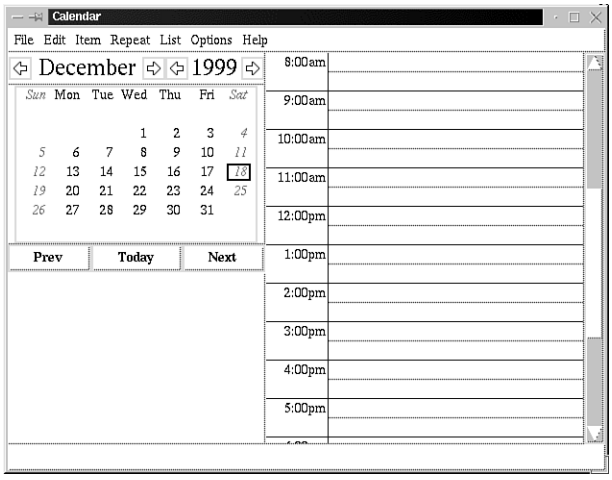
You can also change geometry settings to set the initial calendar size, as follows:

```
# ical -geometry 800x600
```

Figure 18.2 shows the ical client.

FIGURE 18.2

The `ical` X11 client features notices, appointments, to-do lists, and reminder alarms.



Notices are created by selecting a day and then clicking on and typing in the box below the calendar. Appointments for the day are created by clicking on a specific time and typing in the name of the appointment. You can drag appointments anywhere during the day to rearrange your schedule by holding down the middle mouse button (or both left and right mouse buttons if you're using a two-button mouse).

After you have set your notice or appointment, you can also set an alarm to have the `ical` client warn you of the upcoming event. To set a reminder alarm, first click the appointment, and then select the Item menu's Properties item to set an alarm for an appointment. You can also just double-click the appointment to bring up the alarm dialog.

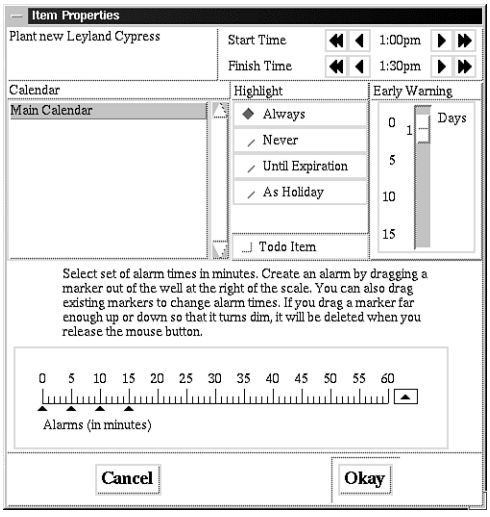
You can tell `ical` to remind you from 1 to 15 days in advance, with up to 60 warnings the hour before an appointment. The `ical` alarm notice window pops up at the previously selected times as a reminder.

The `ical` client must be running in order to receive alarms. You can, however, use the `ical` command and its `-popup` command-line option in a `crontab` entry. If you use `-popup`, `ical` lists all the day's appointments in a window and then exits after you press the Okay button.

Figure 18.3 shows the `ical` client's alarm dialog.

FIGURE 18.3

The `ical` client's alarm dialog features multiple, cascading alarms with drag-and-drop controls.


Item Properties
Plant new Leyland Cypress
Start Time
1:00pm
Finish Time
1:30pm
Calendar
Highlight
Early Warning
Main Calendar
Always
Never
Until Expiration
As Holiday
Todo Item
Days
0
1
5
10
15
Select set of alarm times in minutes. Create an alarm by dragging a marker out of the well at the right of the scale. You can also drag existing markers to change alarm times. If you drag a marker far enough up or down so that it turns dim, it will be deleted when you release the mouse button.
0 5 10 15 20 25 30 35 40 45 50 55 60
Alarms (in minutes)
Cancel
Okay

If you select an appointment or notice, you can also make it repeat daily, weekly, monthly, or annually by selecting the pertinent Repeat menu item. When you cause an item to repeat, it is automatically duplicated in your calendar.

Appointments can also be made to-do items by clicking on the appointment and selecting the Todo Item from `ical`'s Item menu. A box appears at the beginning of the text. Until you complete the item by clicking in the box with your left mouse button to place a check mark, the to-do item will reappear on the next day's list of appointments.

You can list your appointments and notices by using `ical`'s List menu. If you want a hard copy of your calendar, you can print six different built-in calendar formats or specify a range of days. Before you print, you can also preview your calendar.

The `ical` client is a convenient way to organize personal or group tasks. You can take a look at some of `ical`'s companion shell scripts and programs under the `/usr/lib/ical/contrib` directory to find tips and hints on how to customize `ical` to suit your needs.

You can find the latest version (v2.2) of `ical` at `http://www.research.digital.com/SRC/personal/Sanjay_Ghemawat/ical/home.html`.

Checking the Calendar and Keeping Appointments with `emacs`

The `emacs` text editor, more fully discussed in Hour 14, "Text Processing," has a number of features that can help your personal productivity or even keep you amused. You can check the current calendar, see a list of holidays (and more), and keep a diary with appointment reminders.

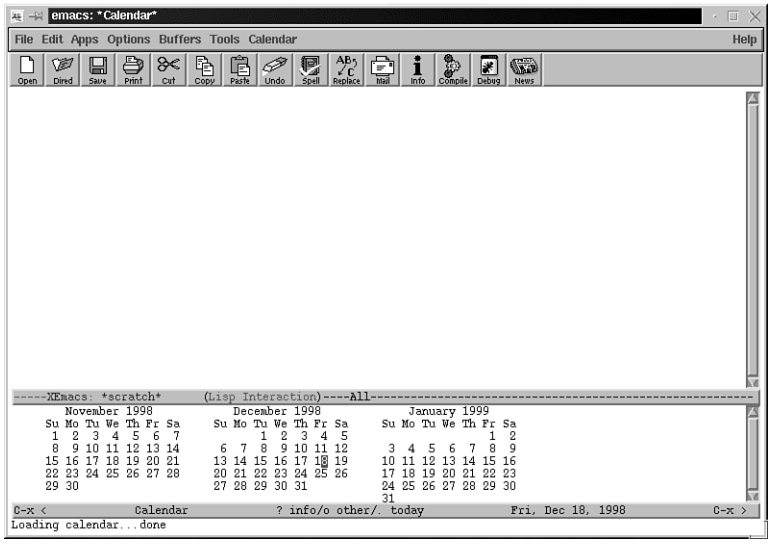
If you're using X11, you automatically run the X11 version of `emacs` unless you use the `-nw` command-line option on the command line to run `emacs` in your terminal window, for example:

```
# emacs -nw
```

After you start the X11 version of `emacs`, you can view a calendar of the previous, current, and next months by clicking Apps, then Calendar, and then 3-Month Calendar on the main menu. The `emacs` editor also offers you a Diary, Holidays, Phases of the Moon, and Sunrise/Sunset times. You can also use the non-X11 `emacs` command, `ESC-x-calendar`. Press the Escape key, type an **`x`**, then type the word **`calendar`**, and press Enter. `emacs` displays a three-month calendar as shown in Figure 18.4.

FIGURE 18.4

The `emacs` editor features a built-in calendar with an assortment of calendar tools, including a diary and appointment reminder.


emacs: *Calendar*
File Edit Apps Options Buffers Tools Calendar Help
Open Dired Save Print Cut Copy Paste Undo Spell Replace Mail Info Compile Debug News
-----XEmacs: *scratch* (Lisp Interaction)----All----
November 1998
Su Mo Tu We Th Fr Sa
1 2 3 4 5 6 7
8 9 10 11 12 13 14
15 16 17 18 19 20 21
22 23 24 25 26 27 28
29 30
December 1998
Su Mo Tu We Th Fr Sa
1 2 3 4 5
6 7 8 9 10 11 12
13 14 15 16 17 18 19
20 21 22 23 24 25 26
27 28 29 30 31
January 1999
Su Mo Tu We Th Fr Sa
1 2
3 4 5 6 7 8 9
10 11 12 13 14 15 16
17 18 19 20 21 22 23
24 25 26 27 28 29 30
31
C-x < Calendar ? info/o other/. today Fri, Dec 18, 1998 C-x >
Loading calendar...done

You can get help on using emacs' calendar tools by typing the question mark after clicking in the calendar window. A help menu of calendar items appears. After you start the calendar mode in emacs, a Calendar menu item will appear on the emacs menu bar.

Use the Calendar menu item's Goto sub-menu to advance the calendar forward or backward, or jump to nearly 20 different types of dates, such as Julian, Islamic, and even Mayan! The Holidays sub-menu either lists all the holidays for a range of days or months displayed by the calendar listing at the bottom of the screen or marks the holidays by highlighting days of the calendar listing. The Moon menu lists the different phases of the moon.

More than 100 different calendar commands (other than obvious menu items) are available in emacs. In order to receive appointment reminders, emacs must be running. For more information, first try calendar's help, and then use the apropos command from emacs' Help menu to get more detailed information.

You can also use emacs to remind you of important events by using Neil Mager's emacs appointment commands. To set appointment reminders, you must first create a .emacs file in your home directory containing the following:

```
(require 'appt)
(display-time)
(appt-initialize)
```

Use the File menu to save this file. Quit, and restart emacs. To create an emacs diary, start the calendar mode. Click the Apps menu, then click the Calendar item, and finally click the 3-Month Calendar item. After you enable the emacs calendar mode, click in the calendar window on a specific day. Then go to the Calendar menu, click the Diary sub-menu, and select Insert Daily. Your scratch buffer changes to "diary," and you find your cursor following text containing the selected date. Make some diary entries, then save the buffer (through the File menu), and exit and restart emacs.

The emacs appointment function is written in the LISP programming language (much of emacs and many of its functions are in LISP). You can learn more about the specifics of setting appointments by reading the source code to the emacs appointment functions, like so:

```
less /usr/lib/xemacs-19.16/lisp/calendar/appt.el
```

Entering Appointments

After you restart `emacs`, you can enter appointment reminders in your diary with the `emacs appt-add` command. First, enter the calendar mode, and click your left mouse button on a specific day. Next, press and release the Escape key, type an **`x`**, then type **`appt-add`**, and press Enter. You're asked, at the command line at the bottom of the `emacs` window, for an appointment time in hours and minutes, like so:

```
Time (hh:mm[am/pm]):
```

Enter the time in the form of a 24-hour clock (such as 15:00) or a 12-hour clock (such as 3:00 pm). After you press Enter, you're prompted for a message, like so:

```
Message:
```

Type in a reminder message (such as "`Wake up!`"), and press Enter again.

Five minutes before the appointment time, `emacs` beeps and then displays a new mode line, informing you of the appointment. Two minutes later, the same thing happens. You can also manually add reminders to your diary file, for example:

```
 8:00am Jogging with dog
12:00am Lunch with Cathy
15:00pm Check with car repair shop
```

You can save these reminders following each date in your diary files to set future appointments. If you want to delete appointments, use the `appt-delete` command after selecting a specific day. You're asked interactively to delete various appointments from your diary.

By using the `emacs` calendar mode and appointment functions, you can build a history of your appointments in your personal diary. Experiment with different modes, and read the `emacs` info files for more information.

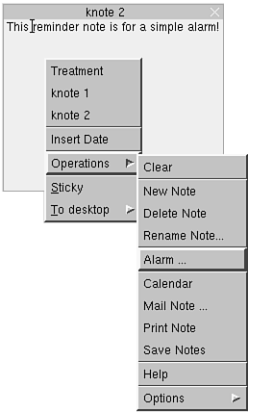
Setting Alarms with the `knotes` Client

You don't need to run large programs or word processors in order to set alarms when you use the K Desktop Environment, or KDE. If you want to try an easy-to-use utility to set reminders or alarms during your X sessions, try the `knotes` client, included with the KDE utilities distribution.

Click the Utilities menu on your KDE desktop's panel and select knotes. A small Post-It™-like window will appear on your desktop. Type in some text, and then right-click in the knotes window. From the pop-up menu, scroll down, select the Operations menu, and then click the Alarm menu item, as shown in Figure 18.5.

FIGURE 18.5

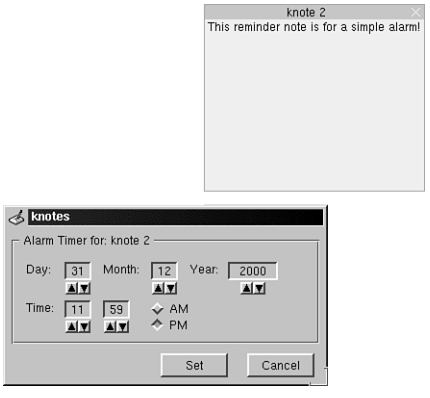
The `knotes` *client, besides sporting easy-to-uses note-taking features, also includes alarms and reminders.*



An alarm dialog box, as shown in Figure 18.6, appears. Click the up and down arrows for the day, month, and year to set the alarm dates. Click AM or PM, and then choose the hour and minute to set the alarm time. When finished, click Set to set the alarm.

FIGURE 18.6

Setting `knotes` *alarms is an easy task with its alarm dialog box.*



Summary

This hour introduced you to a number of personal productivity programs and X11 clients you can use to track your time, set appointments, and document your day.

Q&A

Q **My cursor was on a date in the 3-month calendar, but when I tried to insert a diary entry, `emacs` reported `not on a date`.**

A Try double-clicking the date in the calendar view. When a date is correctly selected, you should see a full list of diary items in the Diary submenu.

Q **I tried running `crontab` with its `-e` option, but the screen cleared and then listed a bunch of apostrophes down the left side of the screen. What's going on?**

A By default, `crontab` uses the `vi` editor. See the `vim` man page for more information on using this editor. Better yet, create and use your own `EDITOR` environment variable to point to the `pico` editor (included with the `pine` email program).

Q **I defined the `EDITOR` environment variable, but when I use `crontab –e`, the program exits with an error. What's going on?**

A Make sure you install the `pine` email program from your OpenLinux CD-ROM or that you include the full pathname to `pico` in your `EDITOR` definition. The shell reports an error and `crontab` also exits with an error.

Exercises

1. Examine this `crontab` entry:

   ```
   15 0 4 * * echo "What day is it?"
   ```

   When and how often will this entry run?

2. Try setting several appointments in `emacs`. What does `emacs` do as the time for an appointment draws near? What happens if you set an appointment and then quit `emacs`?

3. Try setting an alarm or appointment with the `crontab` command. Then try setting an alarm or appointment with the `at` command. Which command is better to use and why?

HOUR 19

Home Office Management with StarOffice

NEW TERM This hour shows you how to get started with StarOffice from Star Division GmbH. This is an office-automation productivity suite, or *office suite*, available for download from `http://www.stardivision.com`. An office suite is a collection of integrated programs, such as a word processor, spreadsheet, and presentation graphics client that can easily share data such as blocks of text, tables of figures, or graphic images.

A good office suite uses many of the same menu commands and has an integrated "look and feel" to help you more easily learn its component programs. A great office suite makes your computing experience more efficient and productive. I think you'll like StarOffice, which is one of the latest and best office suites for OpenLinux. It is free for personal use, but if you use the program for commercial purposes, you must pay a registration fee (see the following note).

This program, combined with the power of your OpenLinux system, provides a great home office productivity solution. You can use StarOffice to produce professionally typeset color documents with very little effort.

In this hour, you'll learn how to install and use StarOffice to create word processing and spreadsheet documents.

This hour describes using StarOffice 5.0. You can download its 50-megabyte compressed archive for free from `http://www.stardivision.com`. You must obtain a customer number and personal key by registering before you can even begin installation of the software.

Installing and Configuring StarOffice

StarOffice is not installed when you install OpenLinux. Unlike other Linux programs, you must install StarOffice through a separate procedure. This involves running an installation script to copy the software to your OpenLinux file system.

The installation is pretty painless, but you need to run X11. You do not have to be logged in as the root operator. When you install StarOffice on a standalone OpenLinux workstation, the installation process installs StarOffice in a directory named `Office50` in your home directory.

You can also perform a network installation or an installation to support multiple users from the same StarOffice install. Read the 36-page StarOffice installation guide. The documentation manual, `install_guide.pdf`, is in Portable Document Format, but you can use the `xpdf` client (which reads `.pdf` files) to read it like this (substituting *`path_to_the_guide`* with the directory path either on CD-ROM or on your hard drive):

```
# xpdf /path_to_the_guide/install_guide.pdf
```

To start the installation, use the `cd` command to navigate to the StarOffice setup directory, and use StarOffice's `setup` command by typing **`./setup`** and pressing the Enter key. The StarOffice 5.0 Installation dialog box appears. Click the Next button to start the install. You then see a Software License Agreement dialog box. Scroll through

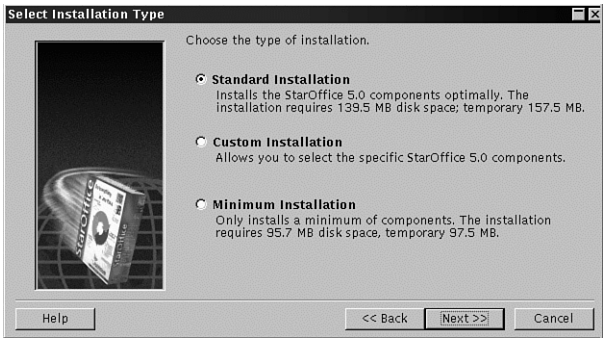
the agreement, and then click the Accept button to continue. A dialog box appears, asking you to enter your personal information. Type in your personal information, such as name, address, phone number, and email address, and then click the Next button. You're then asked to enter a Media Key (or registration information if you're installing a downloaded copy). Type in the key or registration, and click the Next button.

You can change your personal information later. See this chapter's section, "Customizing StarOffice".

You then see a dialog box (as shown in Figure 19.1), asking you to choose a type of installation.

FIGURE 19.1

Choose a type of installation when you install StarOffice 5.0.


Select Installation Type
Choose the type of installation.
Standard Installation
Installs the StarOffice 5.0 components optimally. The installation requires 139.5 MB disk space; temporary 157.5 MB.
Custom Installation
Allows you to select the specific StarOffice 5.0 components.
Minimum Installation
Only installs a minimum of components. The installation requires 95.7 MB disk space, temporary 97.5 MB.
Help
<< Back
Next >>
Cancel

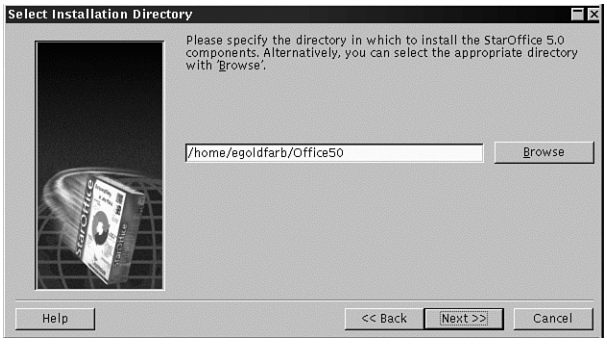
The Standard installation requires nearly 140 megabytes of hard drive space, along with an additional 20 megabytes for temporary files. If you do not have this much space, choose a Minimum installation, which only requires a maximum of little more than 100 megabytes during the install.

You can also choose a Custom installation, but this is not recommended. The best approach is to perform a minimum install and then add any missing components with the Custom installation later.

Click the button next to a desired type of installation. You're then asked where you want StarOffice to be installed, as shown in Figure 19.2.

FIGURE 19.2

Choose a location for the StarOffice 5.0 installation.


Select Installation Directory
Please specify the directory in which to install the StarOffice 5.0 components. Alternatively, you can select the appropriate directory with 'Browse'.
/home/egoldfarb/Office50
Browse
Help
<< Back
Next >>
Cancel

The default is the `Office50` folder in your home directory. If you choose another location, make sure you have read and write permission (see Hour 22, "Handling Files and Your File System"). After you click the Next button and confirm creation of the directory, click the Complete button. You see the install window, as shown in Figure 19.3, displaying the progress of the install. This installation typically takes less than five minutes with a late-model computer.

FIGURE 19.3

StarOffice 5.0 tracks and displays the progress and time remaining of the installation process.

StarOffice 5.0 Installation
StarOffice 5.0
STAR DIVISION
StarDesktop 5.0 – Everything under control!
With StarDesktop 5.0 you have a personal work environment at your disposal which can be freely customized according to your specific needs. Not only does StarDesktop 5.0 now support all operating system icons, but also enables you to directly start external applications.
Preparing the installation
Now creating directories
Now copying and extracting program f...
Creating local settings
Compiling help files
17%
0:03:39

After the software is installed, click the Complete button to exit the `./setup` script.

Make sure to read the text file displayed in the final installation dialog box or the file `README` under the `Office50` directory after installing StarOffice. This text file contains some important hints about installing StarOffice over a network and configuring email, fonts, and printers; it also has a license and short FAQ section about OpenLinux and StarOffice.

Starting StarOffice

StarOffice 5.0 is started by the `soffice` script in the `$HOME/Office50/bin` directory. If you are in your home directory, start StarOffice by using the `soffice` command like this:

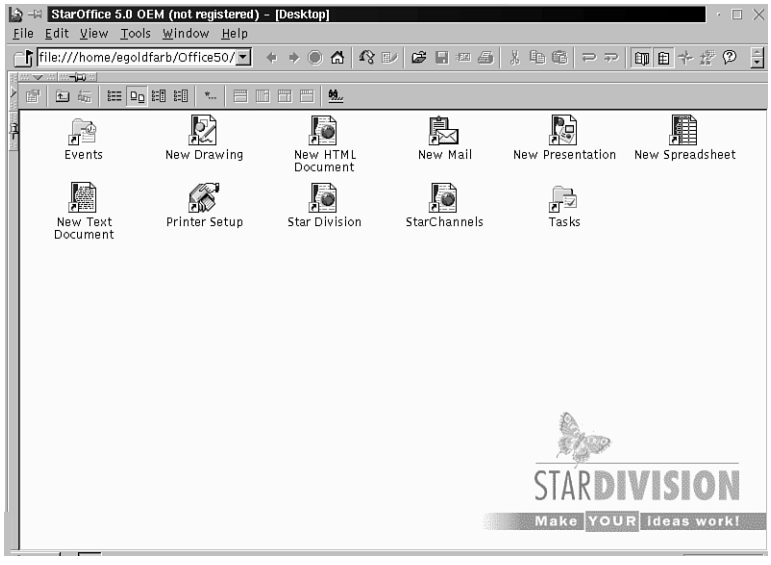
```
# Office50/bin/soffice &
```

After a minute or so, the StarOffice desktop appears, as shown in Figure 19.4.

Don't forget to register your copy of StarOffice at `http://www.stardivision.com!`

FIGURE 19.4

The StarOffice 5.0 desktop features menus, several toolbars, and a Work area with icons for creating new documents or getting help.



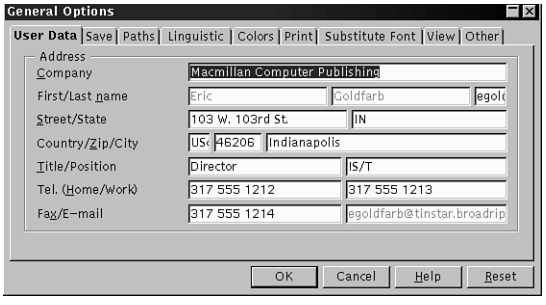
StarOffice performs best on an OpenLinux system with at least 32 megabytes of RAM, or system memory. However, even having twice that much memory can't make it start faster.

Customizing StarOffice

If you made a mistake or want to change the personal information you entered when you installed StarOffice, open the Tools menu, select the Options menu item, and then click General. A dialog box appears, as shown in Figure 19.5, offering you the capability to change a number of default StarOffice features.

FIGURE 19.5

Set various StarOffice options with the General Options dialog box.



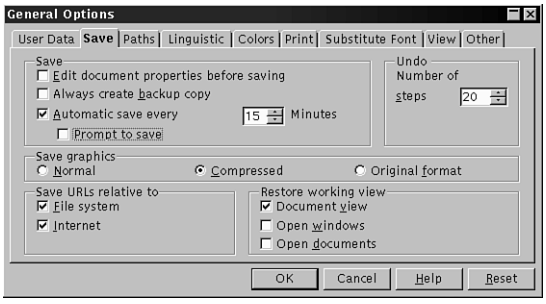
Although not discussed in this hour, in order to use StarOffice Mail, you must enter your name and email address in the personal information dialog box.

One of the first functions to change is to enable auto-saving of documents. Click the Save tab in the General Options dialog box. The defaults Save dialog box appears, as shown in Figure 19.6.

Click the Automatic Save Every checkbox. The default time between saves is 15 minutes, but this value can be set from 1 to 60 minutes. If you want a backup copy made of a working document, click the Always Create Backup Copy checkbox. Also, note that the default number of the Undo scroll box levels is 20. You can set StarOffice to use as many as 100 levels of undo.

FIGURE 19.6

Set automatic saving defaults to ensure documents are routinely saved during StarOffice sessions.



If you select Automatic Save Every, uncheck the Prompt to Save checkbox (shown in Figure 19.6) to avoid having to respond to a dialog box each time StarOffice tries to save your current document.

Other tabs in the General Options dialog box offer settings for spell checking, colors, toolbar button sizes, printer warnings, and languages.

Installing a Printer for StarOffice

Fortunately, if you configured your printer to work with OpenLinux (using the `lisa` command; see Hour 15, "Preparing Documents"), you don't have to change printer settings for StarOffice. If you do need to make changes or want to set up StarOffice to use a different printer than the default generic PostScript printer, click the Printer-Setup icon in StarOffice's work area.

Using StarOffice

The StarOffice *desktop*, or main window, is your entry and launch pad to a number of StarOffice programs. This office suite is a large, capable and complex program with a lot of interface elements. To enlarge the desktop window, double-click the desktop window's title bar (or click the maximize window button, if available).

If you use KDE and need even more room for the StarOffice desktop, use the KDE desktop panel's minimize button, or configure the panel to hide automatically (using the panel's configuration dialog box). To get the absolute most use of your screen real estate, press Shift+Ctrl+I to zoom the current StarOffice work area to full screen. See Table 19.1 for other keyboard commands.

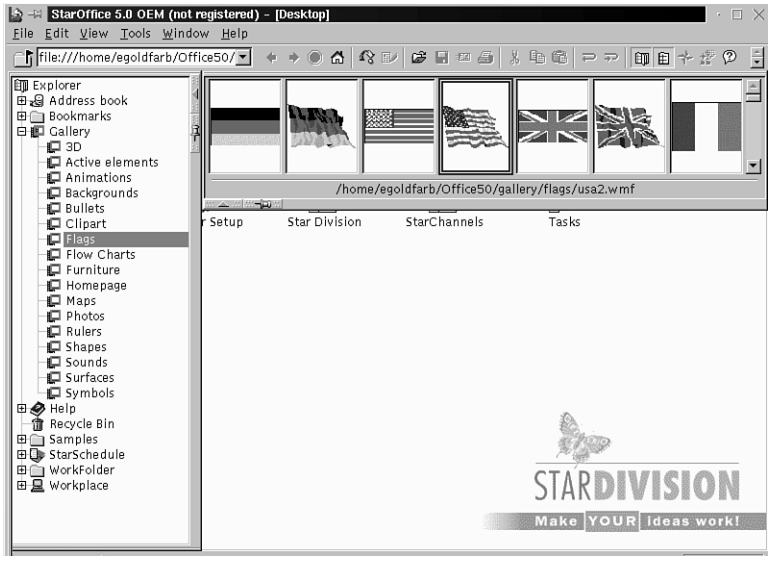
The StarOffice desktop (shown in Figure 19.4) consists of several elements, such as a menu bar with the File, Edit, View, Tools, and other menus. Below the menu bar is the function bar, a toolbar with buttons and other controls. If you click the right-pointing triangle in the upper-left corner of the Work area, an open area on the left side of the desktop appears (and the triangle now points to the left). This button controls the display of the Explorer, which provides quick access to different StarOffice folders (directories), such as the Gallery of artwork or sample documents folder.

The Gallery is installed during a Standard installation, not a minimal installation. If you performed a minimum install, restart the `setup` script, and then choose a Custom installation to install the artwork.

To see a list of installed artwork, open the Explorer, and then click on the small plus sign (+) in front of the Gallery icon in the Explorer. A list of graphics categories drops down. Double-click a category, such as Flags, and the first several files appear in the *Beamer* (as shown in Figure 19.7).

FIGURE 19.7

The Beamer in the StarOffice desktop displays the graphics or files in a directory.



The Beamer is used to view the contents of directories or graphics files listed in the Explorer window (and also for placing graphics into documents; see the following section "Creating Documents with StarWriter"). Note that the Beamer shows the currently selected file's pathname. Click the minus sign(-) in front of the Gallery icon in the Explorer to close the Gallery and the Beamer.

The *work area* is the largest part of the StarOffice desktop. It contains icons that represent *links* to different documents or help files. Your first step is to create a project folder to organize your work.

Right-click a blank area of the work area. A pop-up menu appears. Select the New menu item, and then click Folder. The folder appears in the work area. Type a name for the folder, such as MyProjects. Hold down your left mouse button on the folder, drag the folder to the Explorer window, and drop it—the folder disappears from the work area and is now in the Explorer.

Creating Documents with StarWriter

StarWriter is the word processor portion of the StarOffice office suite. This program is integrated into the StarOffice desktop and can share information with other parts of StarOffice, such as StarCalc (see the section "Calculating with StarCalc," later in this hour). StarWriter has all the features of a modern word processor, which include the following:

- Automatic spelling checking and correction
- Building of tables, footnotes, and indexes
- Complete search and replace capabilities, including styles
- Complete style controls
- Complex text and font control, including kerning and spacing
- Cut, copy, paste, and draggable text selections
- Document-creation wizards (AutoPilot)
- Drag-and-drop of StarOffice document items (such as data or graphics)
- Drawing tools, fields, and graphic insertions
- Hyphenation controls
- Import and export of different file formats (see Table 19.2)
- Insertion of hyperlinks
- Macro support
- Multiple views, including layout and outline

- Multiple zoom levels for enlargement/reduction
- Revision control
- Templates for documents and layouts
- Thesaurus support

Start by creating a StarWriter document in your new project folder. Double-click your project folder in the Explorer, and the work area clears.

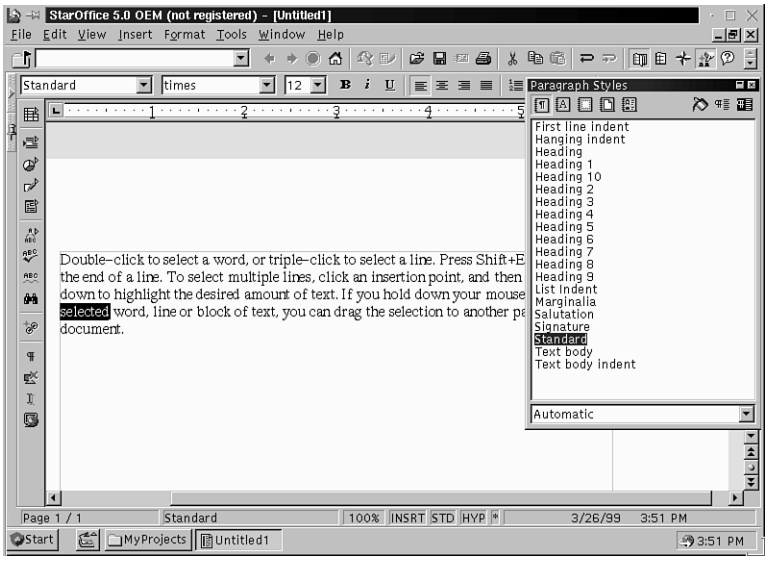
There are several ways to create a new document:

- Click the Start button in the lower left corner of the desktop, and then click the Text Document menu item.
- Open the File menu, select the New item, and then click the Document submenu item.
- Press Ctrl+N and select a document type from a list of 70 different template documents.
- Open the File menu, select AutoPilot, and then click Letter, Fax, Agenda, or Memo

For now, double-click your project folder in the Explorer, hide the Explorer, and then right-click in your project's work area. Select New from the pop-up menu, click Documents, and then click the Text Document menu item. A StarWriter text document window appears in the work area, as shown in Figure 19.8.

FIGURE 19.8

The current StarWriter document appears in the StarOffice work area.



Note that StarOffice has a taskbar similar to KDE's at the bottom of the desktop window. To quickly navigate back to the initial desktop, click its button (between the Start button and the MyProjects folder's button) in the taskbar. For now, click in the blank page, and type a paragraph or so.

StarWriter's document work area has a horizontal rule and formatting toolbar above it and a vertical toolbar to the left of it. The ruler is used to set margins and tab stops, whereas the formatting toolbar is used to set font attributes and justification. The vertical toolbar can be used for a number of actions, such as table, field, or graphics insertions, spell checking, or search and replace procedures.

Double-click to select a word, or triple-click to select a line. Press Shift+End to select to the end of a line. To select multiple lines, click an insertion point, and then drag up or down to highlight the desired amount of text. If you hold down your mouse button on a selected word, line, or block of text, you can drag the selection to another part of your document.

To format text, select the appropriate toolbar icon, or right-click the text and select attributes from a pop-up menu. Character formatting from the Format menu can be used to access more complex controls, such as font effects, style, size, or color.

StarWriter has many different keyboard commands you can use while creating documents. See Table 19.1 for a list of common commands (also shared by StarCalc) and their actions.

TABLE 19.1 STARWRITER COMMON KEYBOARD COMMANDS

Action	*Keyboard Command*
Abort menu operation	Esc
Check spelling	F7
Copy	Ctrl+C
Cut	Ctrl+X
Edit menu	Alt+E
File menu	Alt+F
Format menu	Alt+O
Function Navigator	F5
Help menu	Alt+H

continues

TABLE 19.1 CONTINUED

Action	*Keyboard Command*
Insert menu	Alt+I
New file	Ctrl+N
Open file	Ctrl+O
Paste	Ctrl+V
Print	Ctrl+P
Quit	Ctrl+Q
Search & Replace	Ctrl+F
Select All	Ctrl+A
Thesaurus	Ctrl+F7
Toggle full-screen mode	Ctrl+Shift+I
Tools menu	Alt+T
Undo	Ctrl+Z
View menu	Alt+V
Window menu	Alt+W

Spellchecking and Saving StarWriter Documents

Checking the spelling of documents is an important task. Misspelled words can have a detrimental effect on your professional image and even your career. Fortunately, StarOffice comes with a built-in spelling checker that not only works with StarWriter documents, but any StarOffice document, including graphic images with embedded text!

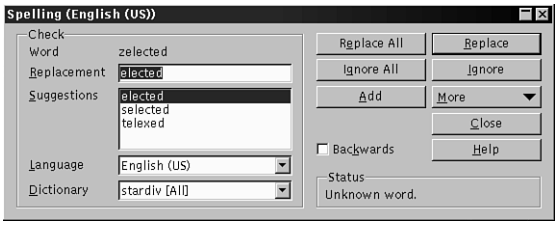
Open the Tools menu, select Spelling, and then click the Check menu item to start the spelling checker. If you don't want to use a menu or your mouse, press F7.

The Spelling dialog box appears, as shown in Figure 19.9.

The spelling checker highlights and displays the first misspelled word found after the current insertion point in your document. Continue through the document, and click the appropriate button to ignore, replace, or globally ignore the word in your document. Correctly spelled but unrecognized words can be added to your personal dictionary by clicking the Add button. When you finish, click the Close button.

FIGURE 19.9

StarOffice spell checks all document types and not just StarWriter documents.



You can also use automatic spell checking while you work. Enable Auto Spellcheck to have StarWriter automatically underline any misspelled or suspect words. Open the Tools menu, select Spelling, and then click Auto Spellcheck. You can also click the small ABC icon underlined in red on the vertical toolbar to the left of the work area to enable automatic checking.

To set StarOffice and its components to always use automatic spell checking, open the Tools menu. Select Options, and then click the General menu item. In the General Options dialog box, click the Linguistic tab, and check the Check Spelling as You Type check box. Press the OK button to save your changes.

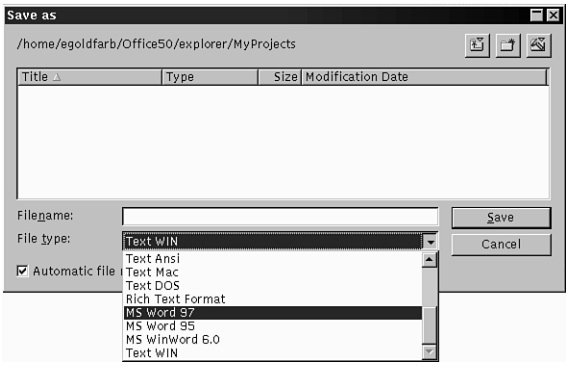
To save your document, press Ctrl+S, or open the File menu and click the Close menu item. StarWriter can open (import) and save (export) a variety of file formats, as shown in Table 19.2.

TABLE 19.2 STARWRITER 5.0 FILE FORMATS

Name	*Type*
MSWord 6.0/95, 97	Microsoft Word for Windows 6.0, 95, 97
Rich Text Format	RTF
StarWriter 1.0 (read-only), 2.0, 3.0, 4.0, 5.0	StarOffice
StarWriter HTML	Hypertext Markup Language
Text (ANSI, DOS, Mac)	Text format

FIGURE 19.10

StarWriter can read and save documents in a number of formats.



To save your document in a different format, click the drop-down File Type menu (as shown in Figure 19.10), and then click the OK button.

Calculating with StarCalc

StarCalc is the spreadsheet component of StarOffice. Like StarWriter, this program integrates with the StarOffice desktop and can share information, such as tables of data or graphics, with other StarOffice components. For example, you can create a spreadsheet and then paste the data in a StarWriter document.

When you work with StarCalc, you quickly see that it's easy to create even complex spreadsheets. As you probably know from Hour 17, "Learning Math and Financial Tools," spreadsheets are handy for storing, tracking, visualizing, and forecasting data. In this section you learn the basics of creating and saving a StarCalc spreadsheet.

There are several ways to create a StarCalc spreadsheet:

- Double-click the New Spreadsheet icon in the StarOffice desktop's work area.
- Open the File menu, select New, and then click Spreadsheet.
- Click the Start menu, and then click the Spreadsheet menu item.
- Type Ctrl+N, and then select a spreadsheet type from a template dialog box.

For now, double-click your project folder in the Explorer.

You can also click the drop-down menu on the StarOffice toolbar (below the menu bar), and then click a previously visited document or folder.

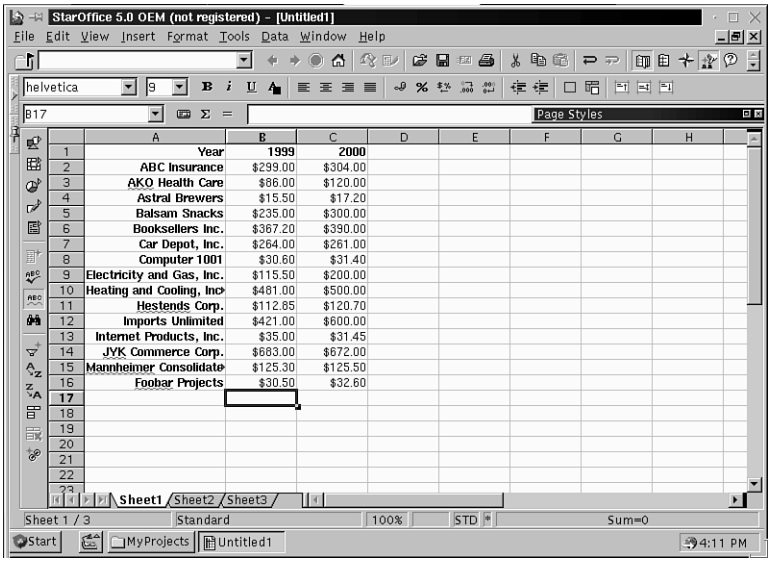
Next, right-click your mouse in a blank spot in your work area. From the pop-up menu, select the New menu, select Documents, and then click the Spreadsheet menu item. The work area clears, and you see a familiar blank spreadsheet grid with row and column headers (as shown in Figure 19.11).

Note that the toolbar above the work area includes a cell selection and data entry field.

Enter some data into columns and rows by clicking an insertion point and typing a number. Press the Tab key to enter the data and move right. Press the Enter key to enter the data and move down.

FIGURE 19.11

StarCalc is a comprehensive and capable spreadsheet calculator that can share data and graphics with other StarOffice components.

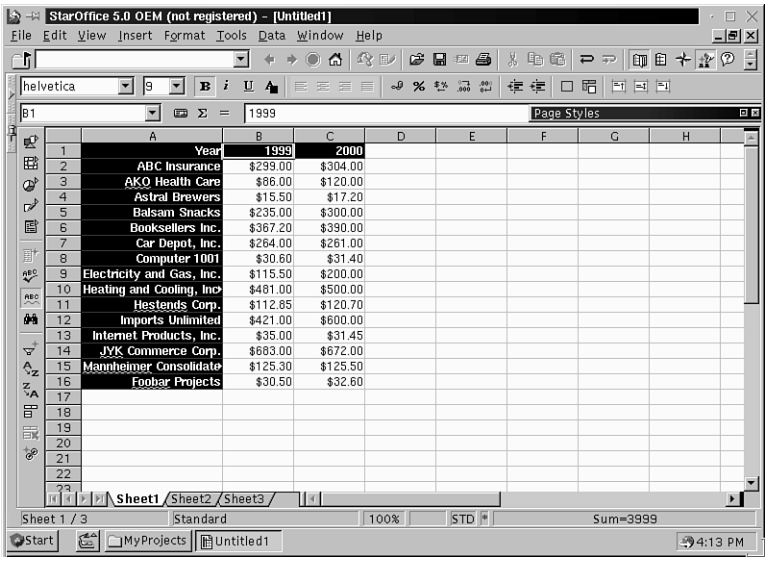


	A	B	C	D	E	F	G	H
1	Year	1999	2000					
2	ABC Insurance	$299.00	$304.00					
3	AKO Health Care	$86.00	$120.00					
4	Astral Brewers	$15.50	$17.20					
5	Balsam Snacks	$235.00	$300.00					
6	Booksellers Inc.	$367.20	$390.00					
7	Car Depot, Inc.	$264.00	$261.00					
8	Computer 1001	$30.60	$31.40					
9	Electricity and Gas, Inc.	$115.50	$200.00					
10	Heating and Cooling, Inc	$481.00	$500.00					
11	Hestends Corp.	$112.85	$120.70					
12	Imports Unlimited	$421.00	$600.00					
13	Internet Products, Inc.	$35.00	$31.45					
14	JVK Commerce Corp.	$683.00	$672.00					
15	Mannheimer Consolidate	$125.30	$125.50					
16	Foobar Projects	$30.50	$32.60					
17								
18								
19								
20								
21								
22								
23								

NEW TERM Numbers and text can be formatted like those in a StarWriter document. Single cells are selected by a mouse click. Multiple cells are selected by selecting a cell and then dragging with the left mouse button held down. An ingenious feature is a *discontiguous* selection, where multiple selections are made without the selected regions adjoining. You can use discontiguous selection to format two or more areas of your spreadsheet at the same time. Click the first cell, and then drag to select the first area. Hold down the Ctrl key and click and drag to select another area (see Figure 19.12). You can now format the cells as needed.

FIGURE 19.12

StarCalc supports advanced formatting features, such as discontiguous selection.



To perform quick totals of your data, click in the bottom cell of a column of numbers, and then click the Sum button (the Σ) next to the equal(=) sign in the data entry field above your work area. An X and a check mark appear next to the data entry field, which has the SUM formula inserted. Click the check mark to accept the entry, or click the X button to cancel.

When you finish, press Ctrl+S, or open the File menu and click Save to save your work. StarCalc can import and export a variety of spreadsheet document formats, as shown in Table 19.3.

TABLE 19.3 STARCALC SUPPORTED SPREADSHEET FORMATS

Type	*Name*
dBase	Dbase database
DIF	Document Interchange Format
HTML	Hypertext Markup Language
MSExcel 5.0/95, 97	Microsoft Excel for Windows 5.0, 95, 97
StarCalc 3.0, 4.0, 5.0	StarCalc
SYLK	Symbolic Link format
Text, CSV	Text, cell values

StarCalc supports all the keyboard commands listed in Table 19.1. You can also select and move blocks of highlighted data around the sheet using the same drag-and-drop mechanism as with StarWriter text.

Graphing with StarCalc

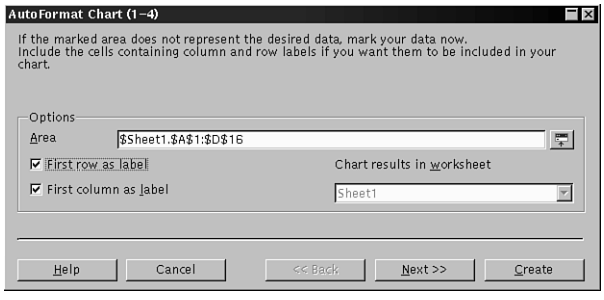
StarCalc can easily create complex graphs of your spreadsheet's data. The first step is to click and drag to select the desired spreadsheet data.

To start drawing a graph, click the Insert Object button (the third button down) on the vertical toolbar to the left of your chart's work area. A small toolbar appears. Click the tiny chart icon, and your cursor turns into a plus sign (+) with a tiny chart. Click and drag on a blank area of your spreadsheet to set the initial size of your graph. When you release your left mouse button, the AutoFormat Chart dialog box appears, as shown in Figure 19.13.

You can also open the Insert menu and click the Chart menu item to start the AutoFormat Chart dialog box.

FIGURE 19.13

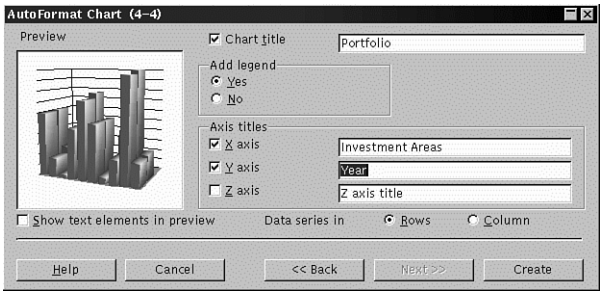
StarCalc's AutoFormat Chart dialog box is an easy way to start creating chart graphics of your spreadsheet's data.



To build your chart, select any desired options and click the Next button. Continue through the AutoFormat dialog boxes until you arrive at a final dialog box with a button labeled Create (as shown in Figure 19.14).

FIGURE 19.14

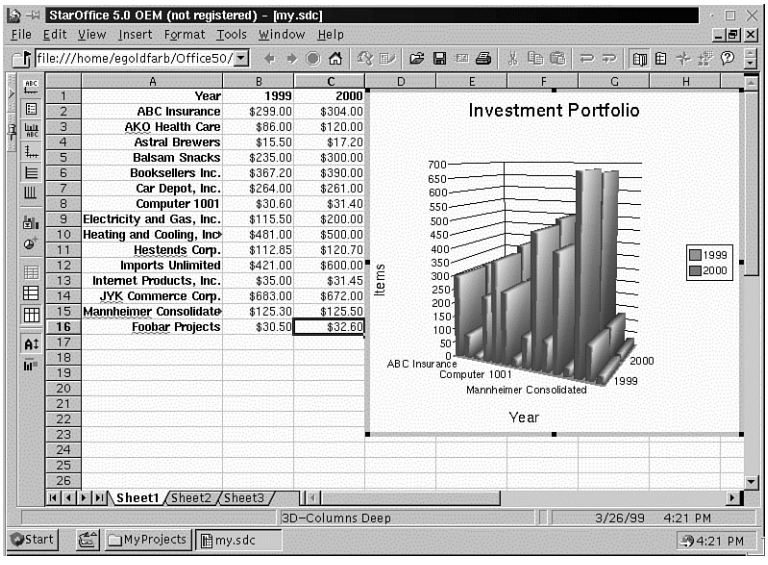
A single click of a button creates a chart graphic of your spreadsheet's data.



Your chart appears in the previously selected area of your spreadsheet (as shown in Figure 19.15). You can then move, resize, or edit the chart. If you click the chart and then press Ctrl+C, you can paste the chart into another StarCalc or StarWriter document.

FIGURE 19.15

StarCalc can create professional chart graphics of your spreadsheet's data.



Summary

This hour introduced you to StarOffice for OpenLinux. This office suite provides a professional set of programs you can use to be more productive. You learned how to install StarOffice, and then start StarWriter and StarCalc to create great-looking documents. StarOffice comes with several other programs, such as a database, graphics, and presentation package. Read the StarOffice user's guide to learn more about this great set of programs from Star Division.

Q&A

Q **I started installing StarOffice but got an error!**

A Carefully read any error messages, and then look at the StarOffice installation guide. The installation script requires X11! Upon a serious error, the StarOffice installation aborts and returns you to your shell prompt. It is possible to get an installation error if you repeatedly choose an installation type, cancel, and then reattempt an installation without quitting the installation script first. Try reinstalling again.

Q **I've installed StarOffice from CD-ROM, but how do I eject my CD-ROM?**

A Use the `umount` command. See Hour 22, "Handling Files and Your File System."

Q **Where are documents saved when I use StarOffice?**

A Look under the `Office50/explorer` directory for any folders you created.

Q **I want to learn more about using StarOffice. What other documentation is included?**

A Look for the file `user_guide.pdf` included with the StarOffice distribution. Then, use the `xpdf` client to read or print the document.

Q **Why doesn't my Backspace key work?**

A Check to see if you disabled the `XKEYBOARD` extension in your `XF86Config` file (see Hour 3, "Post-Installation Issues"). You can also try the `xmodmap` command, like this:

```
# xmodmap -e "keycode 22 = BackSpace"
```


Exercises

1. Create a StarWriter document, and then type multiple paragraphs. Triple-click a line of text, hold your left mouse button down on the highlighted text, and drag down to the end of your document. Release your mouse button. What happens?
2. Leave your StarWriter document open. Click the Desktop button in the lower left corner of the StarOffice desktop. Double-click the New Spreadsheet icon in the StarOffice work area. Create a spreadsheet, enter some data, and create a graphic. When the graphic appears, click the graphic, and then press Ctrl+C. Select the Window menu, and click your StarWriter document. Click an insertion point, and press Ctrl+V. What happens?
3. Highlight some data in your StarCalc spreadsheet. Press Ctrl+C. Navigate to your StarWriter document, click an insertion point, and press Ctrl+V. What happens?

HOUR 20

Relaxation and Playing Linux Games

Now it's time to sit back, relax, and have some fun. Chances are that you skipped the rest of the book and are reading this chapter first. Well, that's okay because we all know the real reason we bought our computers, right? To zap hordes of alien invaders streaming across the screen!

In this hour you'll learn how to play music CDs with the amazing `kcsd` client. You'll also learn about some of the more than 70 games included with OpenLinux.

Playing Music CDs with the `kscd` and `xplaycd` Clients

Using your computer as a stereo system might seem a bit extravagant, but it's nice to be able to listen to music while you work. Besides, playing music CDs with OpenLinux is not only easy; it's convenient and fun!

If your sound card works with Linux, great! You can start playing music

CDs right away. You can find several music CD player clients installed with OpenLinux that you can use during your X sessions.

One of the best CD players is the `kscd` client that comes with KDE. This program not only plays CDs, but if you have an active Internet connection, `kscd` goes out in the Internet, queries a remote computer with your music CD's serial number, and retrieves the name of your music CD, the artist's name, the number of tracks, and the name of each track. You can save this information in a database on your hard drive.

Before you begin, use the `chmod` command to set the permissions of your CD-ROM so that anyone can read your CD, like this:

```
# su -c "chmod 664 /dev/cdrom"
```

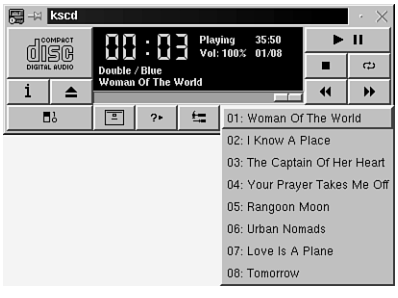
You don't have to use KDE to use the `kscd` player. However, you must have KDE installed on your system.

Start your Internet connection, and then start `kcsd`. If you're using KDE, click the Application Starter button on your desktop's panel, scroll up to Multimedia, and click the CD Player menu item. If you're using another window manager, type `kcsd &` at the command line and press Enter. The `kcsd` dialog box appears as shown in Figure 20.1.

The `kscd` player automatically goes out in the Internet and tries to locate your CD's artist and title. If you need to configure `kcsd`, such as what Internet database to query or colors and fonts to use in its display, click the Configure `kscd` button (the one with the hammer and screwdriver).

FIGURE 20.1

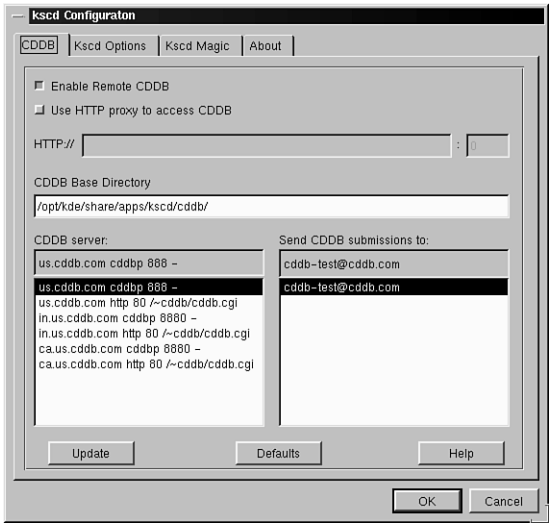
The `kcsd` *audio CD player connects to Internet databases to show you information about your audio CD.*



The Configuration dialog box appears, as shown in Figure 20.2. Note that the Enable Remote CDDB (CD database) button is selected. If `kscd` has trouble connecting to a particular remote Internet database, click a different CDDB server in the CDDB server list. Deselect the Enable Remote CDDB button if you don't want `kscd` to use the Internet.

FIGURE 20.2

The `kscd` Configuration dialog box is used for communications and display settings.

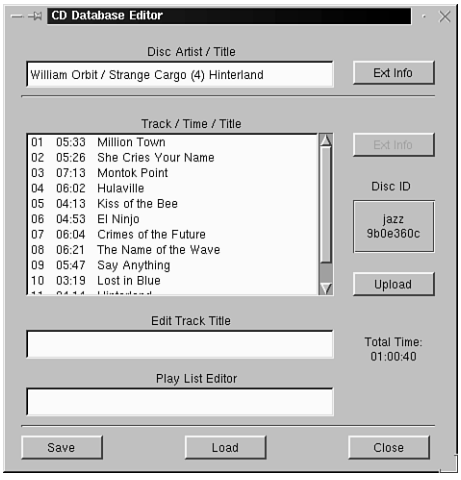


Use the CDDB Base Directory field to specify the pathname to your system's audio CD database. As you use `kscd`, you can save each CD's information in this database. To access `kscd`'s database controls, click the CDDB dialog box button in `kscd`'s main window (immediately to the right of the player's power button).

The CD Database Editor dialog box appears, as shown in Figure 20.3. `kscd` fills out most of the information about your CD from information retrieved by the remote Internet server (this happens almost instantaneously, as only a small amount of information is sent and received). Click the Save button, and you're asked to pick one of 10 different categories of music.

FIGURE 20.3

The `kscd` *database dialog box is used to save information about your audio for use the next time you play the CD.*



Playing Music with the `xplaycd` Client

The `xplaycd` client, by Olav Woelfelschneider, is another client you can use to play music CDs. The program appears in a small window with the standard music CD controls, along with horizontal stereo volume bars and a list of buttons representing the tracks on the CD. You can raise or lower your music's volume by clicking your left mouse button ahead of or behind the horizontal bars.

Start this player from the command line of a terminal window, like this:

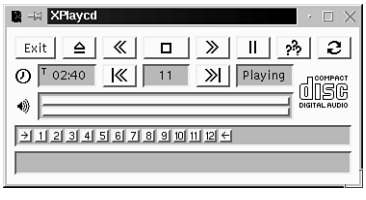
```
# xplaycd&
```

The player appears, as shown in Figure 20.4.

One great feature of this program is the capability to reorder tracks and even play a track multiple times. By clicking a track number and dragging, you can rearrange the play sequence of the tracks on your CD. To play a track multiple times, click a track number with your mouse's middle button and drag the track along the CD track sequence. When you release your mouse button, the track number is duplicated.

FIGURE 20.4

The `xplaycd` *player features draggable track numbers to reorder or repeat playing of music tracks.*



Not using X? Don't worry—you can play music CDs with Sariel Har-Peled's `cdp` command, found under the `/usr/bin` directory. This command is a text mode program and is started from the command line of your console, like this:

```
# cdp
```

When `cdp` starts, you see a list of the tracks on your CD. Turn on the NumLock key of your keyboard to control how to play your CD. Table 20.1 lists the controls for playing CDs from your keyboard's keypad.

TABLE 20.1 THE *cdp* COMMAND KEYPAD CONTROLS

Action	*Keypad Key*
Soft exit (music continues)	0
Help	.
Back 15 seconds	1
Hard abort (eject CD)	2
Forward 15 seconds	3
Previous track	4
Replay CD	5
Next track	6
Stop	7
Toggle pause/resume	8
Play	9

The `cdp` command has a number of command-line options. A symbolic link, called `cdplay`, can be used to play music without `cdp`'s interactive screen. Tell `cdplay` to start playing music at a certain track with the `play` option, followed by a track number, like this:

```
# cdplay play 3
```

This command line starts the `cdp` program, and your music CD starts playing from the third track.

Games for the Console

If you don't use X11, you also can have fun at the console because you can find an assortment of nearly 60 classic games you can play. Look under the `/usr/games` directory.

One of the classics is the `adventure` game. This features an interactive text screen where you enter simple commands to try to delve into a cave, retrieve treasures, and escape in one piece. Start the game by typing the full pathname to the program, like this:

```
# /usr/games/adventure

Welcome to Adventure!!  Would you like instructions?
yes

Somewhere nearby is Colossal Cave, where others have found fortunes in
treasure and gold, though it is rumored that some who enter are never
seen again.  Magic is said to work in the cave.  I will be your eyes
and hands.  Direct me with commands of 1 or 2 words.  I should warn
you that I look at only the first five letters of each word, so you'll
have to enter "northeast" as "ne" to distinguish it from "north".
(Should you get stuck, type "help" for some general hints.  For
information on how to end your adventure, etc., type "info".)
                                - - -
This program was originally developed by Will Crowther.  Most of the
features of the current program were added by Don Woods.  Address
complaints about the UNIX version to Jim Gillogly (jim@rand.org).

You are standing at the end of a road before a small brick building.
Around you is a forest.  A small stream flows out of the building and
down a gully.
```

Enter commands such as `inven`, `look`, `go west` (or `n`, `w`, `s`, `e`, `up`, or `down`). Type `quit` to exit the game.

Want the challenge of a good chess game? Try the `gnuchess` program, which plays an extremely strong game of chess. You can find several versions of this game installed on your system. The `gnuchess` version uses cursor addressing to provide a basic graphic display. The `gnuchessr` version scrolls each board after successive moves and uses reverse video and cursor addressing for a fancier display.

Moves are entered by specifying the column and row as a letter and number, as in the following example:

```
# gnuchess
Enter [moves] minutes[:sec] [increment][+]:
Computer                                  GNU Chess

  +--+--+--+--+--+--+--+--+
8 | *R | *N | *B | *Q | *K | *B | *N | *R |
  +--+--+--+--+--+--+--+--+  Playing without hashfile
7 | *P | *P | *P | *P | *P | *P | *P | *P |
  +--+--+--+--+--+--+--+--+
6 |    |    |    |    |    |    |    |    |
  +--+--+--+--+--+--+--+--+
5 |    |    |    |    |    |    |    |    |
  +--+--+--+--+--+--+--+--+
4 |    |    |    |    |    |    |    |    |
  +--+--+--+--+--+--+--+--+   1:   White
3 |    |    |    |    |    |    |    |    |
  +--+--+--+--+--+--+--+--+
2 |  P |  P |  P |  P |  P |  P |  P |  P |
  +--+--+--+--+--+--+--+--+
1 |  R |  N |  B |  Q |  K |  B |  N |  R |  Your move is?
  +--+--+--+--+--+--+--+--+
    a    b    c    d    e    f    g    h

    Human
```

If you don't want to specify a timer, just press Enter after starting the game. To move the pawn up two squares from the lower rank, enter **e2e4**, and press the Enter key. The computer then makes its move, and new piece positions are updated on your display. The `gnuchess` program has more than 23 command-line options and features display play modes, hints, and timed games. For more information, see the `gnuchess` manual page.

Playing `emacs` Games

The venerable `emacs` editor (discussed in Hour 14, "Text Processing") not only edits text, reads mail, and handles your appointments, but also comes with 18 wacky games and modes that you can use to pass the time, such as `doctor`, `dunnet`, `psychoanalyze-pinhead`, and `yow`.

To play `dunnet`, a text adventure, use `emacs` from the command line:

```
# emacs -batch -l dunnet
Dead end
You are at a dead end of a dirt road.  The road goes to the east.
In the distance you can see that it will eventually fork off.  The
trees here are very tall royal palms, and they are spaced equidistant
from each other.
```

```
There is a shovel here.
>
```

This command line starts the game. At the > prompt, enter commands such as `inventory`, `look`, or `go east`. To end the adventure, enter the word `quit`.

Games for the X Window System

In this section you'll be introduced to several games for X11. There are more than two dozen you can play, but rather than discussing them all, the following pages highlight several of the best games for strategy and action.

If you like playing board games, you're in luck! There are several good board games for the X Window System on this book's CD-ROM. Want more action? Try some of the video arcade games—you're sure to find some you like. The following is a list of just a few of those that are included:

- abuse—futuristic combat game for X
- acm—aerial combat simulator for X
- koules—smash balls into the wall game for X
- paradise—a networked combat game
- scavenger—Lode-runner for X11
- xchomp—classic Pac-Man-like game
- xdemineuer—minesweep-type game
- xjewel, xtrojka, xbl—Tetris-like games
- xlander—a lunar lander game
- xpilot—networked combat game
- xpuzzles—a series of puzzle games for X11

Playing Chess with the `xboard` Client

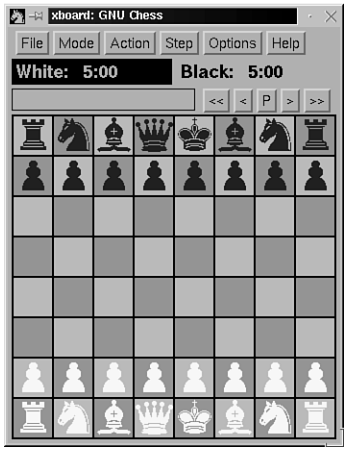
Chess is a classic game, and one of the major challenges you can face is playing chess against your computer. To play chess in X11, use the `xboard` client. This program uses the GNU chess engine and can play chess over the Internet or through electronic mail.

The `xboard` client (shown in Figure 20.5) recognizes many X11 Toolkit options, such as geometry settings, and has 54 different command-line options. If you have a display smaller than 1024×768 pixels, use the `-size` or `-boardSize small` command-line option to fit the board on your screen, like this:

```
# xboard -size small &
```

FIGURE 20.5

The `xboard` X11 client plays chess on your display, over the Internet, or through email.



This command line starts `xboard` using smaller chess pieces. For more details about using `xboard`, see the `xboard` and `gnuchess` manual pages.

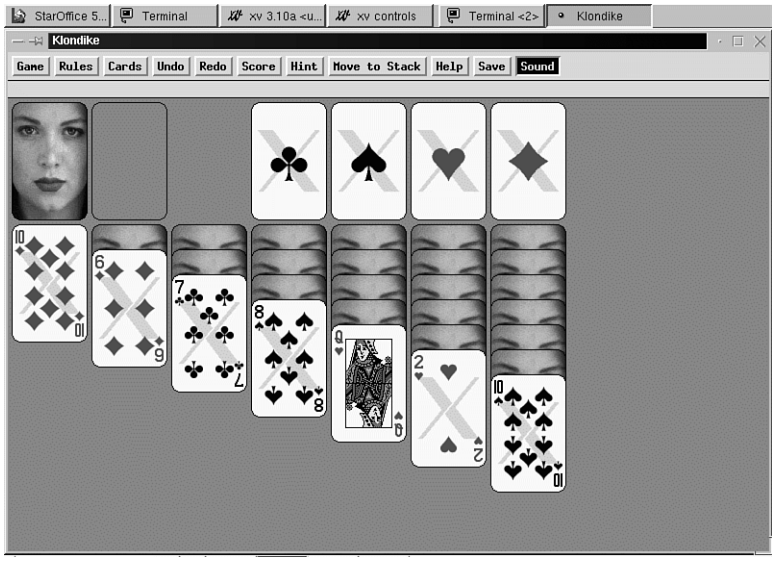
Playing X11 Solitaire

If you enjoy playing card solitaire games, you'll like the `xpat2` X11 client. This program (shown in Figure 20.6) features 14 different solitaire games with scoring, hints, built-in help, and sound. Start the game from the command line of a terminal window, like this:

```
# xpat2 &
```

FIGURE 20.6

The `xpat2` solitaire game for X11 features 14 different card games.



The xpat2 game, created by Heiko Eissfeldt and Michael Bischoff, is found under the /usr/X11R6/bin directory. For more details, read the xpat2 manual page.

Playing Backgammon for X11

For backgammon fanatics, the xgammon client (shown in Figure 20.7) produces hours of fun and practice. This game, by Lambert Klasen and Detlef Steuer, requires the X Window System and runs comfortably on an 800×600 pixel display.

Start xgammon from the command line of a terminal window, like this:

```
# xgammon&
```

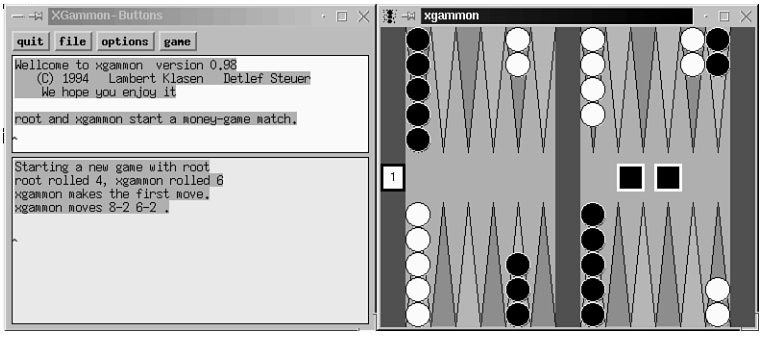


FIGURE 20.7

The xgammon game for X11 features several types of play, such as computer against human, and provides a challenging game.

The xgammon client has 21 different command-line options. For an interesting variation, try watching your computer play itself:

```
# xgammon -g cvc &
```

This starts the xgammon game so you can watch the action. You also can create your own challenging games by editing the board and placing backgammon stones in different positions before play. For details about xgammon, read its manual page.

Playing Galaga for X11

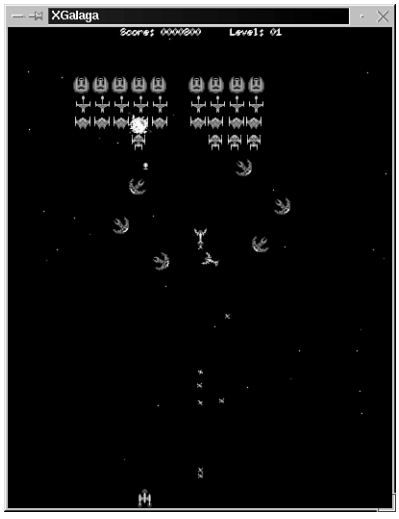
Video action arcade games can be a lot of fun, especially if they have great graphics and sound. If you like shoot-em-ups, you'll love the xgal game by Joe Rumsey. This X11 client features a simple keyboard interface.

The xgal game (shown in Figure 20.8) has six different command-line options, but you can start the program without any at a terminal window by typing the following:

```
# xgal &
```

FIGURE 20.8

The `xgal` *game for X11 features spiffy arcade action and good sound.*



To start playing, press your spacebar. Use the right and left cursor keys to move your ship across the screen, and use your Spacebar to fire.

Breakout the Fun with the X11 Client `xboing`

`xboing`, by Justin C. Kibell, is a fast-paced, arcade-quality paddle and ball game for the X Window System. This game sports great graphics and sound and provides hours of fun. You can start the `xboing` program from the command line of a terminal window. You need a display of at least 1024×768 pixels to play.

By default, `xboing` does not use sound, so if you want to hear sounds when you play, you must use the `-sound` command-line option. Set the speed of the ball's action after playing a game to fine-tune the challenge by using the `-speed` option:

```
# xboing -sound -speed 7
```

This command line starts `xboing` with sound enabled and a very fast ball speed. Another good option to use is `-grab`, which keeps your cursor within the `xboing` X11 window, preventing you from accidentally activating other windows and missing any action. For more details about playing this game, see the `xboing` manual page.

Playing `Quake` for X Windows

`Quake`, by id Software, is a follow-up game to `Doom`, one of the most popular arcade games to hit the personal computer scene in recent years. You can't find a copy on this book's CD-ROM, but you can download Quake in a version for Linux and X11.

You need to download the `quake106.zip` shareware resource file (unless you own a copy of Quake) from `ftp://www.cdrom.com/pub/idgames/idstuff/quake/`, and the `quake.x11-1.0-i386-unknown-linux2.0.tar.gz` file from `http://www.mikrus.pw.edu.pl/lds/quake/files.html`.

Follow the installation instructions to install this version of Quake for OpenLinux. Quake II fans and Linux users interested in setting up a Quake server for Internet or network games can check out the `xqf` Quake server browser and launcher. Browse to `http://www.linuxgames.com/xqf/`.

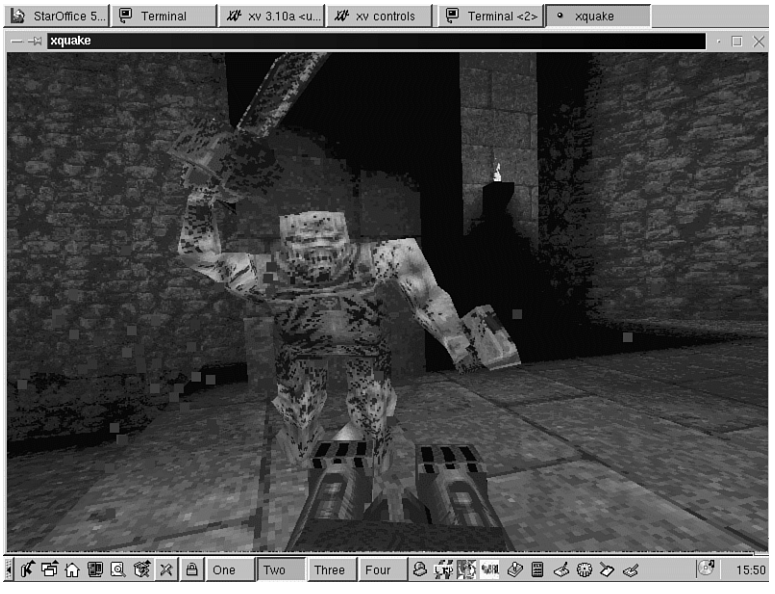
Navigate to the directory where you installed quake, and start `Quake` from the command line, like this:

```
# quake.x11
```

The game starts playing in demo mode (Figure 20.9 shows some of the action). The window can be resized with your mouse or dragged around the desktop.

FIGURE 20.9

Don't lose your head while playing `Quake` *for Linux!*



If you have the shareware or commercial Quake CD inserted in your computer, you get the Quake soundtrack. If you have any music CD inserted, different tracks play as you play the game.

Summary

This hour introduced you to just a fraction of the games available for OpenLinux and the X Window System. You're sure to find some favorites installed on your system.

Q&A

Q How can I find out how many games are installed with OpenLinux?

A Try using the `apropos` command, like this:

```
man apropos
```

Q I want to record sound from my audio CD to a disk file? How can I do this?

A Try the `cdda2wav` command.

Q I want to convert sounds from another operating system and use them with OpenLinux. What conversion tools are included?

A Try the `sox` command.

Q I want to play `.mp3` files. What program should I use?

A Try the `mpg123` command.

Q I like simulation games. Is one included with OpenLinux?

A Yes. A very good city-building simulator is `xlincity`. You can also find the X11 client `Freeciv`, a free Civilization clone (which uses the `civserver`, `civclient`, and `civ` commands for play).

Q I know there are more games than that installed. Is there a better way?

A Try using the `kpackage` client included with KDE, and then look under the `Recreation` folder.

Q Speaking of KDE—how many games are included with KDE?

A You can find nearly a dozen at the time of this writing. Of course, you can always check `http://www.kde.org` to find the latest selection.

Exercises

1. Download and install the Quake for X11 programs for OpenLinux. Are there any other Web sites supporting Quake and Linux? How do you find out?
2. Use the `xmixer` command to experiment with the sound input and output controls of your computer's sound system. Try recording some sounds with the sound recording script in Hour 3.
3. From the command line of a terminal window, start the `xteddy` client. What happens?

PART V

Administering Your System

Hour

21 Basic System Administration

22 Handling Files and Your File System

23 Backing Up and Restoring Your System

24 Using Scheduling to Automate System Management

HOUR 21

Basic System Administration

This hour introduces you to the basics of system administration. You'll learn how to use the `su` command, how to get information about your system, how to manage other users, and how to use file tools to keep your OpenLinux system running in top form. Although much of what's discussed in this hour consists of common-sense guidelines, you'll also get some valuable tips on squeezing the best performance out of Linux. You'll use this knowledge in the next three hours, which cover handling files, archiving, and scheduling.

Even if you're the only person who uses your computer, you should still learn basic system administration skills, for at least some of the following reasons:

- To back up or restore your system, or at the least, important files
- To conserve disk space
- To install new software or upgrade your Linux system
- To teach someone else about OpenLinux, such as a coworker, friend, spouse, or child
- To troubleshoot problems

Although some of the tasks described in this chapter require root permission (you must run a command as the root operator), you should not always log in and use OpenLinux as the root operator. Here's a good reason: Always running as root can be dangerous because you have access to all files on the system and can delete, move, or copy any file at will. You can wipe out your OpenLinux system (remember the warning in Hour 5, "Manipulation and Searching Commands," about the `rm` command) and any other mounted filesystem with this command:

```
# rm -fr /*
```

If you run Linux from your own account, this problem won't happen because `rm` will complain with "Permission denied" and quit. What if you're logged in under your account but need to do things to your system as the root operator? This is where the `su` command comes into play.

Running as the root Operator with the `su` Command

The `su` command, or substitute user command, allows you to run a command as any user on your system. Found in the `/bin` directory, `su` has seven different command-line options. Several of the most common are covered here. Although you'll most likely use `su` to become root, this command can be handy if you want to become another user and troubleshoot problems with email or printing. Using the `su` command is easy; for example, to become the root operator, use `su` like so:

```
# su -
Password:
su: incorrect password
```

By default, the `su` command will allow you to become the root operator if you call it without a username. (Use the hyphen command-line option to make sure you run as the root operator with root's environment variables.) You'll be asked to enter a password, and `su` will complain and quit if you enter the wrong one. If you enter the right password, you'll be logged in as root. To return to your shell, use your shell's `exit` command:

```
$ su -
Password:
# whoami
root
# exit
exit
$ whoami
bball
```

This example, using the `whoami` command, shows that after you execute the `exit` command, you're returned to your normal user status. Another handy feature of the `su` command is the `-s` command-line option to run a different shell. If you want to try a different shell without using the `chsh` command to permanently change your shell, you can use the following:

```
$ printenv ¦ fgrep SHELL
SHELL=/bin/bash
$ su -s /bin/ksh
Password:
# printenv ¦ fgrep SHELL
SHELL=/bin/ksh
# exit
$
```

This example (showing the output of the `printenv` command piped through the `fgrep` command) shows that although the default shell is `bash`, the `su` command allows you to temporarily use the `pdksh`, or public domain Korn shell. Unless you specify your own username, you'll run the new shell as the root operator. A better approach is

```
$ su -s /bin/ksh yourusername
```

Finally, you can also use the `su` command to execute a single command when you use the `-c` command-line option. This can be handy to perform tasks only permitted for the root operator, such as mounting a flash memory card:

```
# su -c "mount -t vfat /dev/hde1 /mnt/flash"
Password:
```

This command line mounts the `/dev/hde1` device, a SunDisk flash card with a VFAT (long-filename) filesystem, at the `/mnt/flash` directory mount point. If you need to temporarily mount or unmount diskettes, CD-ROMs, Zip disks, or other devices, you'll find this a convenient approach. Hour 22, "Handling Files and Your File System," covers mounting and unmounting other filesystems.

If you're using Linux in the console mode (not running X11), you can use the console keys (Alt+F1 and so on) to run a virtual console as the root operator to do root operator tasks. This is a bad convenience, however, because you might be tempted to run as root all the time. At least using the `su` command makes you think about why you're running as root. Be careful!

The next section introduces you to tools you can use to determine how your system is working.

Getting Disk Space Information

When you installed Linux, you installed your system onto a partition, designated by a specific device, such as `/dev/hda1`, `/dev/sdb1`, and so on. I hope you made the partition large enough to accommodate your present and future needs. How do you check to see how much room you have left on disk or for that matter, how many disks you have? Although Linux can support partition sizes up to 4 terabytes and maximum file sizes up to 2 gigabytes, not many of us are wealthy enough to own, or even need, that much storage. Even though disk storage is getting cheaper, it is still at a premium when you have a lot of software installed or need the work space.

Getting Filesystem Statistics with the `df` Command

The `df` (free disk space) command, found in the `/bin` directory, will gather and summarize some important statistics about all currently mounted filesystems. The `df` command is easy to use:

```
# df
Filesystem         1024-blocks  Used Available Capacity Mounted on
/dev/hda3             497699  443871    28124     94%   /
/dev/hda1             509856  469632    40224     92%   /mnt/dos
/dev/hdc1               3868    2596     1272     67%   /mnt/flash
/dev/hdb              644324  644324        0    100%   /mnt/cdrom
```

This output shows four different filesystems on three different devices mounted under Linux. The first is the root partition at the `/` directory on `/dev/hda3`; the second is a DOS partition under `/mnt/dos` on `/dev/hda1`; the third is a flashcard under `/mnt/flash` on `/dev/hdc1`; and the fourth is a CD-ROM, mounted under `/mnt/cdrom` on `/dev/hdb`. The `df` command also lists the size of the storage device, how much has been used, how much is available, and the current capacity of the device. Notice that the CD-ROM has no space left. This is because it is mounted read-only, meaning you can't save or delete files on this device. The command shown in the next example will let you know.

One handy way to find out about the different filesystems you have mounted is to use the `mount` command. This command is usually used during startup by the root operator to mount and unmount filesystems, but any user can use `mount` to show what type of filesystems are in use and how the filesystems are mounted:

```
# mount
/dev/hda3 on / type ext2 (rw)
/dev/hda1 on /mnt/dos type msdos (rw)
none on /proc type proc (rw)
/dev/hdc1 on /mnt/flash type msdos (rw)
/dev/hdb on /mnt/cdrom type iso9660 (ro)
```

This shows that your root partition, on the / directory, is a Linux ext2 filesystem mounted read-write, whereas /mnt/dos and /mnt/flash contain DOS partitions, also read-write. (The /proc filesystem is a special directory Linux uses for process reporting, such as running applications, system state, and so on.) Finally, mount reports that your CD-ROM is mounted as a read-only iso9660 filesystem.

You can use this information from mount to get specific information with the df command, by using the df command's -t, or filesystem, option:

```
# df -t ext2
Filesystem         1024-blocks  Used Available Capacity Mounted on
/dev/hda3             497699  443873    28122     94%   /
```

This tells df to only show information about any mounted ext2 filesystems. You can get a list of valid filesystems to specify with the df command by looking at the mount manual page. The mount command is covered in more detail in Hour 22, "Handling Files and Your File System." You can see that by using the df and mount command, you can get reports on the type of mounted devices, how the devices are mounted, and how much room you have left on each.

Getting Filesystem Disk Usage with the du Command

The du (disk usage) command, found in the /usr/bin directory, conveniently summarizes how your disk is being used by reporting the amount of space required by each directory or specified path. Although the du command has more than 20 command-line options, this section presents some of the common ones and leaves it up to you to experiment. You can use the du command by itself, or specify a directory or path:

```
# du
904     ./book
12080   ./mail
1       ./.tin/.mailidx
1       ./.tin/.index
10      ./.tin
...
589     ./News
9       ./.index
7       ./.procmail
5       ./.ncftp
418     ./reading
778     ./documents
27199   .
```

This report (for brevity, not all the directories are listed) shows the contents of a home directory, with a total for 27199 1KB blocks. If you find this hard to understand, you can have `du` report the size in bytes:

```
# du -b
897606  ./book
12294410        ./mail
1024    ./.tin/.mailidx
1024    ./.tin/.index
9382    ./.tin
561715  ./News
4033    ./.index
4139    ./.procmail
2791    ./.ncftp
424037  ./reading
784216  ./documents
26785752        .
```

If this is too much information for you, then you can use the `--summarize` option to get the total in either kilobytes (with the `--kilobytes` or `-k` option) or bytes (with the `-b` or `--bytes` option:

```
# du -b --summarize
26786903        .
```

The `du` command can also help you keep track of directories which, unattended, sometimes grow out of control or use a lot of disk space. If you specify a path, `du` will report on the different size of the directories underneath that path, which might help you pinpoint those containing too much information:

```
# du --summarize -b /var/* ¦ sort -nr
6474535 /var/lib
2336494 /var/log
868163  /var/catman
76362   /var/spool
14591   /var/dt
2385    /var/run
2048    /var/lock
2048    /var/local
1024    /var/tmp
1024    /var/preserve
1024    /var/nis
```

Here, I've combined the `du` command, which has been instructed to summarize the number of bytes in each directory, with the `sort` command, which has been set to use a numerical sort in reverse order. This one-liner, which uses pipes (discussed in Hour 6, "Using the Shell"), will automatically print the largest directories at the top of the output list. You can see that the `/var/log` directory is getting pretty big. The `/var/lib` directory will be large because it contains the `rpm` databases. (`rpm` is discussed in Hour 22.)

Although the `du` command does not, like the `df` command, have a `-t` option to specify which filesystem to report on, you can use the `-x` option to exclude other filesystems. This is handy to avoid including other mounted filesystems such as DOS or Windows. You can have `du` report on other filesystems by specifying a usage report at the `mount` point. For example, `du` will merrily chug along and summarize how much room your Windows directories take up:

```
# du -b --summarize /mnt/dos/* ¦ sort -nr
129486405       /mnt/dos/windows
23929345        /mnt/dos/msoffice
20811654        /mnt/dos/photoenf
7744046 /mnt/dos/tranxit
6828902 /mnt/dos/org2
6647520 /mnt/dos/laplink
5556496 /mnt/dos/acrobat3
4041127 /mnt/dos/pcdr
3753962 /mnt/dos/psp
3603469 /mnt/dos/insync
3176769 /mnt/dos/antvirus
2669335 /mnt/dos/airlite
2408920 /mnt/dos/winfax
...
```

This (shortened) report shows that next to the Windows operating system, the largest space is consumed by certain Windows applications. This information can be helpful in making a decision on what applications to uninstall if you need more disk space.

Checking Symbolic Links with the `symlinks` Command

The `symlinks` command checks symbolic links in designated directories. The `symlinks` command has several command-line options you might find useful, including the `-r` or recursive option you can use to check whole directories. For example, to check your entire file system, use the `-r` option:

```
# symlinks -r /
dangling: /etc/rc.d/rc0.d/K30dialid -> ../init.d/dialid
dangling: /etc/rc.d/rc1.d/K30dialid -> ../init.d/dialid
dangling: /etc/rc.d/rc2.d/K30dialid -> ../init.d/dialid
dangling: /etc/rc.d/rc3.d/S70dialid -> ../init.d/dialid
dangling: /etc/rc.d/rc4.d/S70dialid -> ../init.d/dialid
dangling: /etc/rc.d/rc5.d/S70dialid -> ../init.d/dialid
dangling: /etc/rc.d/rc6.d/K30dialid -> ../init.d/dialid
absolute: /etc/mta/sendmail -> /usr/libexec/sendmail/sendmail
absolute: /etc/mta/rmail -> /usr/libexec/sendmail/rmail
dangling: /boot/System.map-2.0.35 -> /usr/src/linux-2.0.35/System.map
absolute: /usr/doc/html/lg -> /usr/doc/lg-doc-1.0
absolute: /usr/doc/bool-1.1/COPYING -> /usr/doc/Copyrights/GPL
...
```

You can see that this `symlinks` command output shows at least two types of diagnostics for dangling and absolute symbolic links. (There are six: absolute, dangling, lengthy, messy, other_fs, and relative.) Dangling links, or links that point to a non-existent file, might be a cause of concern because OpenLinux cannot determine whether the designated file exists.

See the `symlinks` man page for definitions of the absolute, lengthy, messy, relative, and other_fs link diagnostics.

As a beginning sysadmin, you can use `symlinks` to look at file directories recursively and then print reports about the status of your file system. Here's one handy command line you can use to check all the symbolic links in your Linux filesystem (excluding others, such as Windows):

```
# symlinks -vr / ¦ fgrep "dangling" >symlinkstatusreport.txt
```

This command line uses the `symlinks` command to recursively descend through your OpenLinux file system and report on dangling links. The `fgrep` command then prints all matches when `symlinks` finds a dangling symbolic link and creates your report. As you become a more proficient sysadmin, you'll devise your own bag of tricks to help diagnose your system.

Saving Disk Space

This section gives you some tips on saving disk space. Part of being a sysadmin is maintaining the health of your filesystem and performing cleanup operations occasionally to free disk space. Once you've found some techniques or approaches that work for your system and the way you work on your system, you'll find that you can routinely trim and recover many megabytes of disk space.

One good way to save disk space is not to install a lot of software. For example, how many different word processors do you really need? How many graphics programs do you need? If you find a capable program, delete others that do the same thing. Make sure to read Hour 22 to see how the `rpm` command can help you free disk space and customize your Linux installation by deleting packages of programs and supporting software.

You can often trim the size of your directories by looking for less frequently used programs or collections of graphics or text you don't need. You've already seen one way to find directories that may be candidates for cleanup. You should also consider some other file types that can be deleted.

For example, some Linux programs create backup files with the tilde (~) prefix. You can search for these as follows:

```
# find / -name ~* -xdev
```

Once you feel comfortable with the results, you can pipe the filenames into the `rm` command, using the `xargs` command to build a cleanup command line (although you can also use the `find` command's `-exec` command-line option):

```
# find / -name ~* -xdev ¦ xargs rm -f
```

You should also search for files named `core`. These are *core dumps*, or dumps of program memory created if a program abnormally aborts. Some of these files can be huge! You can use the `bash` or `pdksh` shells' `ulimit` command to limit the size of these core files. To see the current allowable size of core files, use the `ulimit` command's `-c` option:

```
# ulimit -c
1000000
```

Fortunately, the default bash shell `ulimit` setting for the size of core dumps under OpenLinux is 0. If you're a Linux programmer and need core files (for debugging), change this setting.

This doesn't mean that core dumps are limited to 1MB, but 1,000,000 512-byte blocks. You can limit the size of core files with the `-c` option, as in

```
# ulimit -c 1000
```

This sets the maximum size of core files to 512,000 bytes. If you're using the `csh` shell, use

```
# limit coredumpsize 1000
```

Limiting the size of these files is one way to save disk space in the future. Other candidates for removal include

`*.bak`, `*.BAK`—Backup files

`*.o`—Object files created during compiling operations

`#*`—Backup files

`*.1`, `*.2`, `*.3`—File extensions for system log files under the `/var/log` directory. Some logs can grow quite large, and unless you really need them, they should be deleted.

Be careful about deleting files with file-number extensions, such as `.1`, across your system: You will delete a lot of libraries and manual pages if you automate a search-and-destroy mission starting at the root, or `/`, directory.

If you feel uncomfortable with letting the `find` command run through your file system and deleting files, have the command generate a report of candidate files as follows:

```
# find / \( -name core -o -name *.o \) -xdev > deletelist.txt
```

Note that you can also set this command to run unattended, at regular intervals, and have the report emailed to you as an automatic reminder. See Hour 24, "Using Scheduling to Automate System Management," for details.

If you experiment with your own combination of commands, you'll soon design your own customized reports and cleanup actions. You now know how to get information about your drive space. You'll also learn about managing disk space, using quotas (software limits on hard drive usage) in the section "Managing User Access" later in this chapter. For now, you'll learn how to find out more about what's going on in your computer's memory when you run Linux.

Compressing unused files or directories or archiving and then deleting these directories is another way to conserve disk space. See Hour 5, "Manipulation and Searching Commands" for information about using compression utilities. Also, see Hour 23, "Backing Up and Restoring Your System" for details about backing up or restoring OpenLinux files and directories.

Getting Memory Information

NEW TERM Although the industry trend has been to offer more hard drive space and more system memory, or RAM, for less money, many people don't like to outlay more cash to expand their systems. The good news is that Linux is efficient at using memory because even a 16MB system provides enough room (with an equal amount of swap space) to run X11 and most programs well. The bad news is that programs are getting larger all the time, especially with *feature creep*, in which more and more functions creep into programs. (This is true of the Linux kernel, which has tripled in size over the past few years.) This section introduces you to some programs you might find helpful in understanding your system's memory and gives you some tips on conserving memory.

Memory Reporting with the `free` Command

The `free` command shows breakdowns of the amounts and totals of free and used memory, including your swapfile usage. This command, in the `/usr/bin` directory, has several command-line options, but is easy to run and understand:

```
# free
             total       used       free     shared    buffers     cached
Mem:         63136      60064       3072      53664      11080      26992
-/+ buffers/cache:      21992      41144
Swap:       130748       2616     128132
```

This shows a system with 64MB RAM and 131MB of swap space. Notice that nearly all the system memory is being used (normal) and almost 3MB of swap space (great!) has been used.

By default, the `free` command displays memory in kilobytes, or 1024-byte notation. You can use the `-b` option to display your memory in bytes or the `-m` option to display memory in megabytes. You can also use the `free` command to constantly monitor how much memory is being used through the `-s` command. This is handy as a real-time monitor if you specify a .01-second update and run the `free` command in a terminal window under X11. For example, to monitor your disk space in an X11 terminal window, use the free command like so:

```
# /usr/bin/free -b -s1
```

This will print a scrolling report, updated each second, in your terminal window.

Virtual Memory Reporting with the `vmstat` Command

The `vmstat` command, found under the `/usr/bin` directory, is a general-purpose monitoring program, which offers real-time display of not only memory usage and virtual memory statistics, but also disk activity, system usage, and central processing unit (CPU) activity. If you call `vmstat` without any command-line options, you'll get a one-time snapshot:

```
# vmstat
 procs                  memory    swap        io     system         cpu
 r b w   swpd  free  buff cache  si  so   bi   bo   in   cs  us  sy  id
 0 0 0   7468  1060  4288 10552   1   1   10    1  134   68   3   2  96
```

The major types of activity reported by `vmstat` are processes (`procs`), memory (in kilobytes), swap space (in kilobytes), input/output from block devices (hard drives), system interrupts (number per second), and percentages of central processing unit (CPU) time spent on users, the system, and idling.

If you specify a time interval in seconds on the `vmstat` command line, you'll get a continuously scrolling report. Having a constant display of what is happening with your computer can help you if you're trying to find out why your computer suddenly slows down or why there's a lot of disk activity.

Viewing Your Shell's "Ulimit"ations

You've already seen how you can limit the size of core dump files in this hour. There are other settings you can set in your shell. If you're using the `bash` or `pdksh` (`ksh`) shell, you can use the `ulimit` command's `-a` option to print your current settings:

```
# ulimit -a
core file size (blocks)  0
data seg size (kbytes)   unlimited
file size (blocks)       unlimited
max memory size (kbytes) unlimited
stack size (kbytes)      8192
cpu time (seconds)       unlimited
max user processes       256
pipe size (512 bytes)    8
open files               256
virtual memory (kbytes)  2105343
```

If you're using the `tcsh` or `csh` shell, you can use the `limit` command to list the current settings:

```
$ limit
cputime         unlimited
filesize        unlimited
datasize        unlimited
stacksize       8192 kbytes
coredumpsize    0 kbytes
memoryuse       unlimited
descriptors     256
memorylocked    unlimited
maxproc         256
```

NEW TERM These limits are different from limits for the root operator. The limits shown in this example are known as *soft limits* (limits that may be changed by any user). To view the shell's *hard limits* (limits that may only be raised by root), log in as the root operator, and use the `-a` limit option (use `-Ha` for `bash` or `ksh`'s `ulimit` command):

```
$ su
Password:
# limit -h
cputime         unlimited
filesize        unlimited
datasize        unlimited
stacksize       8192 kbytes
```

```
coredumpsize    unlimited
memoryuse       unlimited
descriptors     256
memorylocked    unlimited
maxproc         256
```

As you can see, viewing the limits as the root operator in the `tcsh` shell shows a much different situation. This is another good reason not to run as the root operator. As a sysadmin, you can use these settings to limit the amount of memory or number of processes available to each user. This is extremely handy if you have a number of people working on your computer at the same time and you want to conserve system memory. For using Linux on a standalone computer under your normal login and working conditions, you'll find the default limits quite reasonable.

Reclaiming Memory with the `kill` Command

As a desperate measure if you need to quickly reclaim memory, you can stop running programs using the `kill` command. To kill a specific program, you should use the `ps` command to list current running processes and then stop any or all of them with the `kill` command. By default, the `ps` command lists processes that you own and you can kill:

```
# ps
  PID TTY STAT  TIME COMMAND
  367  p0 S    0:00 bash
  581  p0 S    0:01 rxvt
  582  p1 S    0:00 (bash)
  747  p0 S    0:00 (applix)
  809  p0 S    0:18 netscape index.html
  810  p0 S    0:00 (dns helper)
  945  p0 R    0:00 ps
```

The `ps` command will list the currently running programs and the program's process number, or PID. You can use this information to kill a process with the `-9`, or `SIGKILL` signal:

```
# kill -9 809
```

However, if you need to reclaim memory efficiently, you should use the `ps` command's `m` option, which also lists the memory usage of each process:

```
# ps m
  PID TTY MAJFLT MINFLT   TRS   DRS  SIZE  SWAP   RSS  SHRD   LIB  DT
➥COMMAND
  747  p0      0      3    16   208   364   140   224   224     0   0
➥(applix)
  582  p1    151    274   124   184   436   128   308   268     0  10
➥(bash)
  959  p0     89     20    28   376   404     0   404   320     0  21 ps m
```

```
  367  p0    305    826   220   316   600    64   536   428      0  27 bash
  810  p0    313     38   164   696   968   108   860   596      0  47 (dns
➥helpe
  581  p0    212    508    28   960  1280   292   988   304      0 171 rxvt
  809  p0   2615   1205  3900  3692  8684  1092  7592  4644      0 699
➥netscape
```

Using this information, you can see that if you want to reclaim the most memory, you should stop the Netscape Web browser because it is using nearly 9MB of system memory. Although you wouldn't normally use the `kill` command to stop programs, the `kill` command can be helpful to stop runaway or unresponsive programs. The `kill` command works by sending a signal to the Linux kernel, along with the PID, so the kernel can act on the process. There are various signals you can use, although the `-9`, or `SIGKILL` option, is the most abrupt and drastic. You can see a list of different signals by using the `kill` command's `-l` option:

```
# kill -l
 1) SIGHUP       2) SIGINT       3) SIGQUIT      4) SIGILL
 5) SIGTRAP      6) SIGIOT       7) SIGBUS       8) SIGFPE
 9) SIGKILL     10) SIGUSR1     11) SIGSEGV     12) SIGUSR2
13) SIGPIPE     14) SIGALRM     15) SIGTERM     17) SIGCHLD
18) SIGCONT     19) SIGSTOP     20) SIGTSTP     21) SIGTTIN
22) SIGTTOU     23) SIGURG      24) SIGXCPU     25) SIGXFSZ
26) SIGVTALRM   27) SIGPROF     28) SIGWINCH    29) SIGIO
30) SIGPWR
```

For more details on these signals and the `kill` command, see its manual page.

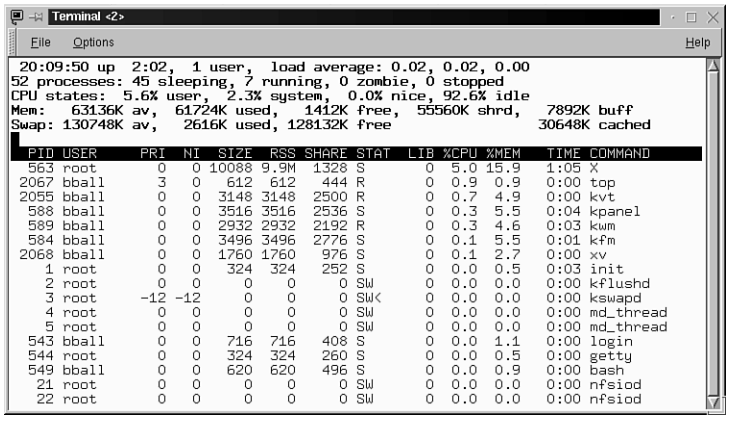
The `ps` command has nearly two dozen command-line options, and you can also list all running processes. See the `ps` manual page for more information. You can also use the `top` command, discussed next, to find and kill processes.

Getting System Load Information with the `top` and `xload` Commands

The `top` command, in the `/usr/bin` directory, is a system monitor that displays statistical information about how Linux is currently handling your memory, swap file, and processes. The `top` program also shows how long your system has been running, the status of your CPU, the size of each process, and more. You'll typically use the `top` command by running it on a spare console or separate X11 terminal window (see Figure 21.1).

FIGURE 21.1

The top command provides an ongoing display of your system.



The `top` command also has a number of interactive controls, including a help screen, accessed with the question mark or the H key. You can also toggle various modes of the display, such as listing processes by memory usage or limiting the number of processes displayed. This can be helpful if you want to monitor only the top five processes that require the greatest amount of your system's memory, and it can help you diagnose problems if your computer starts unusual disk or swap file activity.

You can also use `top` to interactively kill processes, using the K key, or change a process's priority (how much time the CPU devotes to a task) with the R key. The `top` program has 19 different interactive commands, and you can customize its display by adding or removing different information fields and lengthening or shortening the number of processes. See Table 21.1 for more information.

TABLE 21.1 SINGLE-KEY INTERACTIVE COMMANDS FOR `top`

Command	*Description*
c	Display command name or full command line.
Ctrl+L	Redraw the display.
f	Add or remove display fields.
H	Sort display by memory usage.
h, ?	Show help.
i	Toggle display of idle or zombie processes.
k	Kill a process by its process number (PID).
l	Toggle load average and uptime display.
m	Toggle memory information display.

continues

TABLE 21.1 SINGLE-KEY INTERACTIVE COMMANDS FOR `top`

Command	*Description*
n, *x*	Set number of processes (n is interactive).
P	Sort display by CPU usage.
q	Quit.
r	Change priority of a process.
S	Change CPU usage display.
s	Set update delay interval.
Spacebar	Update display.
t	Toggle process and CPU state display.
W	Save current settings to `$HOME/.toprc`.

The `xload` client, used under X11, provides a running graph of your system's load, instead of the `top` command's statistics. System loads vary from computer to computer, but you can generally tell when your system is overloaded by inordinate disk activity because processes are swapped back and forth from your swap file. The `xload` command can give you a visual warning if you're running too many programs and might be especially helpful if you're running X11 on a 8MB or 16MB Linux system.

The `xload` command has eight different command-line options, and you can customize the color of the moving graphic, scale lines, or background.

OpenLinux comes with a number of other helpful utilities you can use to graphically monitor your system. Try the `tload` command if you're using the console. If you use X11, try the `xosview` client, which can also display the status of your computer's network and serial ports.

Determining How Long Linux Has Been Running with the `uptime` and `w` Commands

The `uptime` command, in the `/usr/bin` directory, shows you how long Linux has been running, how many users are on, and three system load averages:

```
# uptime
 12:44am  up  8:16,  3 users,  load average: 0.11, 0.10, 0.04
```

If this is too little information for you, try the `w` command, which first shows the same information as the `uptime` command and then lists what currently logged-in users are doing:

```
# w
 12:48am  up  8:20,  3 users,  load average: 0.14, 0.09, 0.05
USER     TTY      FROM              LOGIN@  IDLE   JCPU   PCPU  WHAT
bball    ttyp0    localhost.locald  9:47pm 15.00s  0.38s  0.16s  bash
bball    ttyp2    localhost.locald 12:48am  0.00s  0.16s  0.08s  w
```

The `w` command gives a little more information, and it is especially helpful if you want to monitor a busy system with a number of users.

Getting Network and Mail Information with the `pppstats` and `mailstats` Commands

The `pppstats` command, in the `/usr/sbin` directory, will give you a running statistical display on the status and activity of your PPP connection. The information is similar to the output of the `ifconfig` command (discussed in Hour 10, "Connecting to the Internet"). To use the `pppstats` program, specify the PPP interface (usually 0) on the command after you have connected to your ISP:

```
# /usr/sbin/pppstats 0
    in   pack   comp uncomp    err  |    out   pack   comp uncomp     ip
 24791     93     74      5      0  |   1922     72     54      4     14
    78      4      3      0      0  |     80      4      3      0      1
   129      2      0      0      0  |    160      3      0      1      2
  1169     23     21      1      0  |    842     23     20      2      1
 12748     28     27      1      0  |    730     27     18      9      0
  9582     18     13      5      0  |    375     13      6      7      0
  9399     18     16      2      0  |    268     12      8      4      0
    71      3      2      0      0  |     80      4      3      0      1
...
```

This shows the `pppstats` command in action after displaying a line of statistics every five seconds during startup of a newsreading session.

The `mailstats` program, part of the sendmail distribution, is in the `/usr/sbin` directory. You can use this program to generate reports about your system's mail usage. This command works by reading a file called `sendmail.st` under the `/var/log` directory. To create and use this file, you must use the `-O StatusFile=/var/log/sendmail.st` option with the sendmail daemon or set the appropriate option in the `/etc/sendmail.cf` file. As a test, you can try this command on an empty sendmail log file in the `/var/state` directory:

```
# mailstats -f /var/state/sendmail.st
Statistics from Wed Dec 23 20:48:29 1998
 M msgsfr bytes_from  msgsto   bytes_to  Mailer
========================================
 T      0          0K      0          0K
```

Monitoring Your Serial Ports with the `statserial` Command

The `statserial` program, originally by Jeff Tranter, can be used to show the status of your serial ports and can be a lifesaver if you need to troubleshoot modems or serial ports. To use `statserial` (in the `/usr/bin` directory), you must specify the device on the program's command line. You can, for example, tell `statserial` to monitor your modem by specifying its symbolic link:

```
# ln -s /dev/ttyS1 /dev/modem
# statserial /dev/modem
Device: /dev/modem

Signal  Pin  Pin  Direction  Status  Full
Name    (25) (9)  (computer)         Name
-----   ---  ---  ---------  ------  -----
FG       1    -      -           -   Frame Ground
TxD      2    3      out         -   Transmit Data
RxD      3    2      in          -   Receive  Data
RTS      4    7      out         1   Request To Send
CTS      5    8      in          1   Clear To Send
DSR      6    6      in          0   Data Set Ready
GND      7    5      -           -   Signal Ground
DCD      8    1      in          0   Data Carrier Detect
DTR     20    4      out         1   Data Terminal Ready
RI      22    9      in          0   Ring Indicator
```

You must be the root operator to use the `statserial` program. Try using `statserial` like so:

```
su -c "statserial /dev/modem"
```

Managing User Access

One of your main jobs as a sysadmin is to manage the users on your system. This involves creating accounts for new users, assigning home directories, specifying an initial shell for the user, and possibly restricting how much disk space, memory, or how many processes each person can use. This section shows you how to use different command-line programs to manage users (such as `lisa`), although you can do these and other tasks with graphical utilities while running the X Window System.

Creating Users with the `adduser` Command

One of the first things you should do after installing OpenLinux is to create user accounts for other family members. (You created a user account for yourself during your OpenLinux installation.) You should do all your work in OpenLinux through your user account and do your system management using the `su` command. There are several ways to create new users in Linux, but this section shows you the easy way, using a trio of commands: `adduser`, `passwd`, and `chfn`.

The first step in creating a new user is to use the `adduser` command, in the `/usr/sbin` directory. You must be the root operator to run this program. If you try to run `adduser` as a regular user, the command will report an error:

```
# adduser
Only root may add users to the system.
```

The `adduser` program also requires you to specify a username on the command line:

```
# adduser cloobie

Looking for first available UID... 502
Looking for first available GID... 502

Adding login: cloobie...done.
Creating home directory: /home/cloobie...done.
Creating mailbox: /var/spool/mail/cloobie...done.

Don't forget to set the password.
```

The command will create an account, assign a user identification (UID) and a group identification (GID), and then create a directory called `cloobie` under the `/home` directory. As a reminder, the `adduser` program tells you to set a password for your new user.

Managing Users with the `lisa` Command

The `lisa` command is an essential system administration tool for OpenLinux. You can use `lisa` to create and manage users through its graphical interface. In fact, you can jump right into `lisa`'s user screen with the `-useradm` command-line option:

```
# lisa --useradm
```

After you press Enter, the `lisa` command will display as shown in Figure 21.2.

FIGURE 21.2

The `lisa` command provides an easy-to-use interface to OpenLinux user administration.

Scroll through the `lisa` menu with the Up and Down cursor keys and then press Enter to display, add, or delete users.

Changing Passwords with the `passwd` Command

NEW TERM After creating your new user, you must assign a password with the `passwd` command. This command will create a default entry of `x` in the `passwd` text database in the `/etc` directory. The real passwords, in encrypted form, are in the `/etc/shadow` file, which has different *read permissions* than the `/etc/passwd` file. (Although anyone can read the `/etc/passwd` file, only the root operator has permission to view `/etc/shadow`.) To show you how this works, the following example first shows the `passwd` and `shadow` file entry for the user, `cloobie`. Then, after creating a new password for the new user, the example shows you the new user's entry in the shadow password file:

```
# fgrep cloobie /etc/passwd
cloobie:x:503:504:Caldera OpenLinux User:/home/cloobie:/bin/bash
```

You can see that although an account has been created and contains a username, UID, PID, name, directory, and default shell, the password field is represented by an `x`. The shadow password file shows

```
# fgrep cloobie /etc/shadow
cloobie:*notset*:9000:0:10000::::
```

To add a password, type the `passwd` command, along with the new user's name:

```
# passwd cloobie
New UNIX password:
Retype new UNIX password:
passwd: all authentication tokens updated successfully
```

You'll be asked for a password and then asked to retype it to verify. If all goes well, the password will be recorded in `/etc/shadow`:

```
# fgrep cloobie /etc/shadow
cloobie:hQSxtwq7CvJ3.:10584:0:10000:-1:-1:-1:1073917872
```

The `/etc/shadow` entry contains the user's name, an encrypted password, and a series of numerical values that detail

- The minimum and maximum number of days before mandatory password changes
- When to warn of a required password change
- How long after a warning a user can change the password
- How long before an account will expire

Later, users can change their own passwords using the `passwd` command, and you should encourage frequent password changes.

You should know that not all Linux distributions use the shadow password system. This system of protecting passwords provides a slight increase in system security by making the system's passwords unreadable by all except the root operator. As the sysadmin, you can change anyone's password if they forget it. Don't forget yours!

Finally, you'll also want to use the `chfn` command to enter formal information about users or have your users enter this information. The `chfn` command, in the `/usr/bin` directory, is used with a username and will prompt you for four lines of information:

```
# chfn cloobie
Changing finger information for cloobie.
Name [Caldera OpenLinux User]: Heronimous J. Cloobie
Office []: Maritime Science Historian
Office Phone []: 703 555-1234
Home Phone []: 703 555-1235

Finger information changed.
```

If you now examine the `/etc/passwd` entry, you'll see

```
# fgrep cloobie /etc/passwd
cloobie:x:503:504:Heronimous J. Cloobie,Maritime Science Historian,
703 555-1234,703 555-1235:/home/cloobie:/bin/bash
```

This information is used by the `finger` command. The formal name may also be used along with the username in mail messages:

```
# finger cloobie
Login: cloobie                          Name: Heronimous J. Cloobie
Directory: /home/cloobie                Shell: /bin/bash
Office: Maritime Science Historian      Office Phone: 703 555-1234
Home Phone: 703 555-1235
Never logged in.
No mail.
No Plan.
```

The `finger` command will extract the user's information from the `/etc/passwd` file and print it in a nice format. One of the other things you should note in a user's `/etc/passwd` entry is the name of a shell at the end. This can be a unique way not only to specify the type of shell used (your Linux system is set up to assign the `bash` shell by default), but also to restrict the user to a particular program.

Restricting Logins

Your users normally can change the shell used after login through the `chsh` command, in the `/usr/bin` directory. You can list the currently available shells by using the `chsh` command's `-l` (list shells) option:

```
# chsh -l
/bin/bash
/bin/sh
/bin/ash
/bin/ksh
/bin/csh
/bin/tcsh
/bin/zsh
```

The `chsh` command looks in a file called `shells` under the `/etc` directory and prints a list. This does not mean that these shells are available (installed), just "acceptable." You can edit this file, adding or removing shells that can be specified by your users. You should make sure that the shells listed in this file are available on your system. To change shells, you can type

```
# chsh -s /bin/ksh
Changing shell for root.
Shell changed.
```

You can also use the `chsh` command to specify a program, other than a shell, to use as the program to run when the user logs in:

```
# chsh -s /usr/bin/pico cloobie
Changing shell for cloobie.
Warning: "/usr/bin/pico" is not listed as a valid shell.
Shell changed.
```

The `chsh` program will complain if the program is not listed as a shell in the `/etc/shells` file. Then, you check whether the change was made:

```
# fgrep cloobie /etc/passwd
cloobie:x:503:504:Heronimous J. Cloobie,Maritime Science Historian,
703 555-1234,703 555-1235:/home/cloobie:/bin/bin/pico
```

The preceding example specified the text editor `pico`, which allows a user to do word processing, printing, or spell-checking, but that's all! As soon as the user logs into Linux, the user is right in the text editor. After quitting the text editor, the user is logged out. This is a handy technique you can use to restrict users, especially children, if you only want them to play a game.

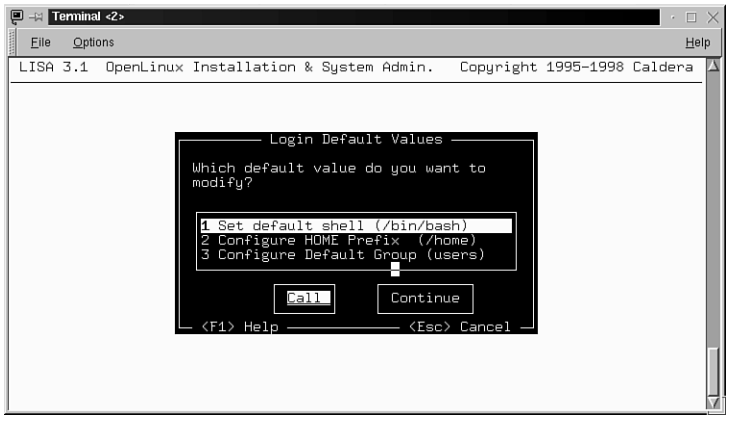
If you want to set the default shell or home directory for all new OpenLinux users, use the `lisa` command like so:

```
# lisa --useradm
```

After you press Enter, scroll down the menu (as shown in Figure 21.2) to Set default values and press Enter. You'll see the `lisa` menu as shown in Figure 21.3.

FIGURE 21.3

The `lisa` command can set the default shell and directories for all your new OpenLinux system users.



You can put other system-wide settings or restrictions in place. The next section shows you how you can limit how much of your system's hard drive can be used.

Setting Disk Quotas

NEW TERM On a large, multiuser systems, *disk quotas* (hard drive storage space limits for users) are not only a way of life, but also a necessity. You can impose disk quotas on your Linux system, and you should, especially if you worry about your disk space or if you're afraid the users will create huge files and overrun your hard drive. You can also use disk quotas as a warning device (and maybe justification for a new hard drive). This section explains how to start, set, and stop disk quotas.

Quota Manipulation with the `quota`, `quotaon`, and `quotaoff` Commands

Disk quotas limit the amount of hard drive space in several ways. You can set quotas for a group of users, using the GID, or impose limits on individual users. To manage disk quotas, you'll use some or all of these commands:

The default Linux kernel included with OpenLinux does not support disk quotas. You must configure, rebuild, and install a new Linux kernel with quota support. For complete and definitive directions on rebuilding your OpenLinux kernel to support disk quotas, browse to `http://www.calderasystems.com/support/techguide/COL12-Kernel-Rebuild-1.html`.

- `quota`—Reports disk quotas
- `quotaon`—Turns on and sets disk quotas for users
- `quotaoff`—Turns off disk quotas for users
- `repquota`—Also reports on quotas
- `edquota`—Edits user quotas
- `quotacheck`—Checks filesystem on quota usage

This book won't discuss all the details of these programs (read the manual pages), but this section shows you how to set a disk quota for the new user you created. The first thing you must do is to enable quotas for your Linux filesystem. This involves editing the filesystem table, `fstab`, in the `/etc` directory.

Be very careful when editing system configuration files in the `/etc` directory, especially the `fstab`, or filesystem table file. You should always first make a backup copy and then make sure you don't make incorrect changes, or you could cause boot problems. You have been warned!

Make sure you're logged in as root, and then use your favorite text editor to open the `fstab` file and edit the line containing the entry for your Linux partition:

```
# <device>    <mountpoint>   <filesystemtype> <options> <dump> <fsckorder>
/dev/hda3                /                         ext2   defaults 1 1
```

Add a comma and the word `usrquota` to the word default:

```
/dev/hda3                /                        ext2
defaults,usrquota 1 1
```

Save the `/etc/fstab` file. Next, use the `touch` command to create a file called `quota.user`, and make the file read-write enabled:

```
# touch /quota.user
# chmod 600 /quota.user
```

After you have done this, reboot your computer using the `shutdown` command with the `-r`, or restart, option. Log back in as root, and use the `edquota` command, in the `/usr/sbin` directory, along with the `-u` option, to edit quotas for your new user:

```
# edquota -u cloobie
```

The `edquota` command will read in the `user.quota` file under your root, or `/`, directory. This file is normally a binary file, but `edquota` will open the file using the text editor defined in your `EDITOR` environment variable. If you don't like the default editor, you can first specify your own temporarily:

```
# EDITOR=/usr/bin/pico;export EDITOR
```

This will make the `edquota` command use the `pico` text editor. When `edquota` runs, you'll end up in your editor with the following text:

```
Quotas for user cloobie:
/dev/hda3: blocks in use: 58, limits (soft = 0, hard = 0)
        inodes in use: 41, limits (soft = 0, hard = 0)
```

Although it is not important to understand all the information here (see Albert M.C. Tam's mini-HOWTO, Quota, in `/usr/doc/HOWTO/mini` for details), you can easily set both the maximum number of files and the maximum size of your user's directory. To set limits to 3 to 5MB for disk space (blocks) and between 500 and 1000 files (inodes), change the values for the soft and hard limits for the blocks and inode listings:

```
Quotas for user cloobie:
/dev/hda3: blocks in use: 58, limits (soft = 3000, hard = 5000)
        inodes in use: 41, limits (soft = 500, hard = 1000
```

Save the file. Then, as a last step, you must set a grace period using `edquota` again, but this time with the `-t` option. Your new user will be warned if the lower, or "soft," limit is exceeded:

```
# edquota -t cloobie
```

You can then set the grace-period warnings for exceeding either the number of files or disk use:

```
Time units may be: days, hours, minutes, or seconds
Grace period before enforcing soft limits for users:
/dev/hda3: block grace period: 1 days, file grace period: 1 days
```

If you want to warn your user right away, use a grace period of one day. (You can also use minutes or seconds.) Finally, you can use the `quota` command to check the new quota:

```
# quota cloobie
Disk quotas for user cloobie (uid 502):
     Filesystem  blocks   quota   limit   grace   files   quota   limit
grace
      /dev/hda3      58    3000    5000              41     500    1000
```

Using disk quotas might sometimes be necessary. If your disk space is at a premium, this could be one way to manage your hard drive resources.

Summary

This hour introduced you to some of the basic system administration skills you need to maintain a computer running OpenLinux. You also learned how to get information about what is going on inside your computer's memory while Linux runs and how to control background processes, users, and system resources, such as hard drive space.

Q&A

Q I tried to define `pico` as my default editor, but I either get an error message or `vi` runs anyway.

A Make sure you have installed the `pine` email program (using `lisa`, `rpm`, or `glint`) from your OpenLinux CD-ROM. The `pico` editor is part of the `pine` distribution.

Q I used `lisa` to remove a user from my system, but the user's directory under `/home` is still there.

A Utilities such as `lisa` do not remove a user's directory. If you use X11, run the Red Hat `usercfg` client. When you click a user's name and then click the Remove button in `usercfg`'s dialog, you see an option to delete the user's home directory. Alternatively, log in as root and use the `rm` command to delete the user's files and directory. You'll also need to remove the user's mail files (in the `/var/spool/mail` directory).

Q What other utilities come with OpenLinux to administer users?

A To handle the administrative chore of creating dozens or hundreds of new users at one time, see the `newusers` command. This command reads a text file containing new users' names and passwords and can create many users with a single command line. To modify a user's account, use the `usermod` command. You can also remove users with the `userdel` command.

Exercises

1. View your system processes with other X11 utilities such as `xosview`, `xload`, or `perf`. How are these clients different?
2. The `/home` and `/var/spool` directories might contain files belonging to your OpenLinux system's users. How can you easily find all files on your system that belong to a user?

HOUR 22

Handling Files and Your File system

This hour continues with the basics of system administration and introduces you to handling files under Linux. You'll learn how to mount filesystems, manage the filesystem table (`fstab`), and format floppies. You'll see how you can protect files and directories. You'll also learn how to install or uninstall software from the command line or during your X sessions.

You will use this knowledge to administer your Linux system. Knowing how to manage file ownership is an important Linux skill and can help you overcome problems later.

One great reason to get up to speed about file access and ownership concerns security. There are some important files in your Linux system that, as root operator, you don't want all users to access. If you've set up your system to handle dial-in calls, you want to make sure that important files, and even other mounted filesystems, such as DOS or Windows, are protected. If you share your computer, you normally wouldn't want other users to have access to your files, but on the other hand, you might want to share files with other people but don't know how.

NEW TERM This hour starts with a discussion of the Linux file system. There's a difference between a file system and a filesystem. A *file system* is the layout of the directories and hierarchy of files on a partition. A *filesystem* is the layout of the lower-level format of a storage device, such as a hard drive. OpenLinux recognizes more than a dozen filesystems. You can find a list in the `fstab`, or filesystem table, manual page in the `/usr/man/man5` directory, but it's best to look at the current list of supported systems in the `mount` command manual page. Why? The `mount` command is used to mount the filesystem at a *mount point*, or path, you specify. For now, take a look at the Linux filesystem.

How OpenLinux Is Organized

The software that comes with the Linux kernel comes from a variety of different UNIX systems. Some programs, utilities, and commands, such as mail, come from a UNIX distribution called the Berkeley Software Distribution, or BSD. Other programs and methods of organizing software, such as startup scripts and the organization of files used during startup, come from either AT&T System V UNIX or later variants. Because of this mixed heritage, Linux has a mix of directories, and although most pundits say Linux leans towards being System V-ish, you'll find elements of BSD and System V.

To give you a better idea, Listing 22.1 contains an edited directory listing, courtesy of the `tree` command.

LISTING 22.1 THE BASIC OPENLINUX FILE SYSTEM, OR DIRECTORY TREE

```
/ - the root directory
¦-- bin - programs considered necessary
¦-- boot - Linux boot image
¦-- dev - devices, like serial ports, printers, hard drives
¦-- etc - configuration files for network, X11, mail, etc.
¦-- home - where users live (including root as a user)
¦-- lib - software libraries, kernel modules
¦-- lost+found - recovered files (from e2fsck)
¦-- mnt - where you mount other filesystems
¦   ¦-- cdrom (CD-ROMs)
¦   ¦-- dos (DOS filesystems)
¦   ¦-- flash (flash memory)
¦   ¦-- floppy (floppy diskette)
¦   `-- zip (Zip drives)
¦-- opt - optional software (such as Applix, KDE, Netscape, or WordPerfect)
¦-- proc - kernel, device, process status files
¦-- root - where the sysadmin works
¦-- sbin - system binaries (many root-only)
¦-- tmp - temp files stored, deleted from here
```

```
¦-- usr - hosts much, much software, libraries
¦   ¦-- X11R6 - X Window System software
¦   ¦-- bin - more software
¦   ¦-- dict - dictionaries
¦   ¦-- doc - FAQs, HOW-TOs, software documentation
¦   ¦-- etc - software configuration files
¦   ¦-- games - fun, fun, fun!
¦   ¦-- i386-linux - development utilities
¦   ¦-- include - header files for programming
¦   ¦-- info - GNU information
¦   ¦-- lib - more software libraries
¦   ¦-- libexec - sendmail, news configuration files
¦   ¦-- local - locally developed programs
¦   ¦   ¦-- bin
¦   ¦   ¦-- doc
¦   ¦   ¦-- etc
¦   ¦   ¦-- games
¦   ¦   ¦-- info
¦   ¦   ¦-- lib
¦   ¦   ¦-- man
¦   ¦   ¦-- sbin
¦   ¦   `-- src - source code to local programs
¦   ¦-- man - manual pages
¦   ¦   ¦-- man1..9n
¦   ¦-- sbin
¦   ¦-- share
¦   ¦-- src - source for the Linux kernel!!!
¦   ¦   ¦-- linux -> linux-2.0.35
¦   ¦   ¦-- linux-2.0.35
¦   `-- tmp -> ../var/tmp
`-- var - system logs, spool directories, compressed manual pages
```

As you can see, the main directory structure is not that complicated. What is important to understand here is that you should know where you are as you navigate the file system. When you install software using package-management utilities such as Red Hat's `rpm`, KDE's `kpackage`, or the `lisa` command (all covered later in this hour), you won't know where software is installed unless you have a basic knowledge of your file system.

Knowing generally where different software should reside on your system might help you track down or troubleshoot difficulties if a problem should arise. Many programs will require different software components to be installed in different parts of your OpenLinux file system.

If you look at the file system listing, you see a `/mnt`, or `mount`, directory. Although you don't have to use this directory as a gateway to other filesystems, this is traditionally where other systems are mounted. The next section discusses how to make these other systems appear under the `mount` directory.

Using the `mount` Command to Access Other Filesystems

The `mount` command, found in the `/bin` directory, is an essential program used not only by system administrators, or sysadmins, but also by OpenLinux during startup and shutdown. This command is used to mount filesystems and make them available in your OpenLinux directory tree. During startup, the primary Linux partition, an `ext2` filesystem, is mounted at the root, or `/`, directory.

You can have other filesystems automatically mounted when OpenLinux starts, or you mount and unmount filesystems, using the `mount` and the `umount` commands, while you work. The Linux `mount` command recognizes and will mount (depending on how your kernel's modules are configured) more than a dozen different filesystems. This section concentrates on the most common, such as `ext2` for Linux, `msdos` or `vfat` for DOS or Windows, and `iso9660` for CD-ROMs.

Support for different filesystems, such as `vfat` (which provides long filenames for Win9x filesystems), is contained in loadable kernel modules.

Understanding the Filesystem Table, `/etc/fstab`

NEW TERM When you start Linux, one of the first scripts to run is the `rc.boot` script under the `/etc/rc.d` directory. This script first mounts the *swap* partition (created when you first installed OpenLinux and used to temporarily hold portions of system memory) and then mounts your OpenLinux partition as read-write after it checks the partition for errors. If everything is okay, it will mount all filesystems described in the filesystem table, `fstab`, in the `/etc` directory with the following command:

```
# mount -avt nonfs
```

This mounts all filesystems described in the `/etc/fstab` (excluding those not meant to be automatically mounted, such as CD-ROMs), which is a short text file:

```
# <device>    <mountpoint>   <filesystemtype> <options> <dump> <fsckorder>

/dev/hda2      /              ext2            defaults 0 1
/proc          /proc          proc            defaults 0 0
/dev/hda3      none           swap            defaults 0 0
/dev/fd0       /mnt/floppy    ext2            defaults,noauto 0 0
/dev/hdc       /mnt/cdrom     iso9660         ro,noauto 0 0
/dev/hda1      /mnt/dos       vfat            noauto,dev,exec,suid 0 0
/dev/sda4      /mnt/zip       vfat            noauto,dev,exec,suid 0 0
/dev/hde1      /mnt/flash     vfat            noauto,dev,exec,suid 0 0
```

The `fstab` columns show the device name, where the filesystem will be mounted, the type of filesystem, any `mount` options, whether the `dump` command (discussed in Hour 23, "Archiving") needs to check for files to be archived, and the order in which the filesystem is checked during reboot.

Your filesystem table will look different from the example shown here, especially if your computer uses a SCSI interface. The filesystem table described here is only an example.

The `fstab` rows show a Linux `ext2` filesystem; the `/proc` or kernel process directory; the OpenLinux swap directory; a floppy diskette drive (`/dev/fd0`); the CD-ROM device (in this listing, the OpenLinux CD-ROM device, `/dev/cdrom`, is a symbolic link to `/dev/hdc`); a DOS filesystem partition on the same hard drive as the Linux `ext2` partition (because both filesystems use the `/dev/hda` device); an entry for an Iomega Zip drive (`/dev/sda4`); and a DOS VFAT filesystem on a flash RAM card.

You should know that editing the filesystem table is inherently dangerous. You learned to add quotas in Hour 21, "Basic System Administration." Always make a backup copy before adding a hard drive, new partitions, and so on. Make sure you have your OpenLinux boot disk on hand (created during installation). If things go awry, you can boot with your floppy, use the `mount` command to mount your OpenLinux partition on your hard drive, and then copy and restore the original `/etc/fstab` file.

Normally, the root operator mounts and unmounts filesystems. If you take my advice and don't run Linux as root all the time, you'll have to use the `su` command to mount and unmount filesystems:

```
# su -c "mount /mnt/cdrom"
```

This command will mount an inserted CD-ROM at the `/mnt/cdrom` directory. The more formal version of this command (depending on what the symbolic link `/dev/cdrom` points to in your system) is

```
# su -c "mount -t iso9660 /dev/hdc /mnt/cdrom"
```

This command uses the `mount` command to specify the filesystem type `iso9660` and the device `hdc` (yours may be different) to be mounted at the `/mnt/cdrom` directory.

Does this seem like a lot of typing? If you want to make this process easier, use the `user` option of the `mount` command. You won't have to use the `su` command to mount CD-ROMs, enter passwords, or type long command lines. For example, open the `/etc/fstab` file with your favorite text editor (as the root operator), and change the original `fstab` entries to

```
/dev/hdc      /mnt/cdrom          iso9660  noauto,ro,user,dev,exec  0 0
```

The `ro` option specifies that the device is mounted read-only. The `exec` option will allow anyone to run programs from the CD-ROM. Save the file after making your changes. You'll be able to mount CD-ROMs without having to be the root operator, by using

```
# mount /dev/hdc
```

or

```
# mount /mnt/cdrom
```

This will automatically mount your CD-ROM's filesystem at the `/mnt/cdrom` path. You'll also be able to switch your disks with the `umount` command, for example:

```
# umount /dev/hdc
```

or

```
# umount /mnt/cdrom
```

Although you should enable this type of convenience only if you're using Linux on a standalone computer, and only for certain types of filesystems, such as CD-ROMs, it is convenient, especially for removable filesystems (such as Iomega Zip disks or flash memory cards). Another type of removable filesystem is the venerable floppy drive. The next section discusses floppy drives and follows with a discussion of a package of floppy utilities that might make life easier when you're dealing with floppies under Linux.

Formatting a Floppy

This section introduces you to four programs you can use to format a floppy from the Linux command line. I also take you step-by-step through the process. You might find this information useful if you want to back up files or use the floppy to install and test new software. You'll also learn how to format and then mount your floppy in Linux-native format using the `ext2` filesystem.

Floppy devices are located under the `/dev` directory; there are quite a few of them. You'll find a device corresponding to just about any type of floppy device ever made. You can look at the `/dev` directory for floppy devices:

```
# ls /dev/fd*
/dev/fd0         /dev/fd0h880     /dev/fd0u3520    /dev/fd1h1494
➥/dev/fd1u1743
/dev/fd0CompaQ   /dev/fd0u1040    /dev/fd0u360     /dev/fd1h1600
➥/dev/fd1u1760
/dev/fd0H1440    /dev/fd0u1120    /dev/fd0u3840    /dev/fd1h360
➥/dev/fd1u1840
/dev/fd0d360     /dev/fd0u1440    /dev/fd0u720     /dev/fd1h410
➥/dev/fd1u1920
/dev/fd0h1200    /dev/fd0u1600    /dev/fd0u800     /dev/fd1h420
➥/dev/fd1u2880
/dev/fd0h1440    /dev/fd0u1680    /dev/fd0u820     /dev/fd1h720
➥/dev/fd1u3200
/dev/fd0h1476    /dev/fd0u1722    /dev/fd0u830     /dev/fd1h880
➥/dev/fd1u3520
/dev/fd0h1494    /dev/fd0u1743    /dev/fd1         /dev/fd1u1040
➥/dev/fd1u360
/dev/fd0h1600    /dev/fd0u1760    /dev/fd1CompaQ   /dev/fd1u1120
➥/dev/fd1u3840
/dev/fd0h360     /dev/fd0u1840    /dev/fd1d360     /dev/fd1u1440
➥/dev/fd1u720
/dev/fd0h410     /dev/fd0u1920    /dev/fd1h1200    /dev/fd1u1600
➥/dev/fd1u800
/dev/fd0h420     /dev/fd0u2880    /dev/fd1h1440    /dev/fd1u1680
➥/dev/fd1u820
/dev/fd0h720     /dev/fd0u3200    /dev/fd1h1476    /dev/fd1u1722
➥/dev/fd1u830
```

The most common devices for 3.5-inch, 1.44MB floppies are

`/dev/fd0`—Drive A

`/dev/fd1`—Drive B

A number of supported floppy formats are listed in the `fdprm`, or floppy drive parameter file, in the `/etc` directory. Take a look at a portion of the file:

```
# /etc/fdprm  -  floppy disk parameter table

# Common disk formats. Names are of the form
#  actual media capacity/maximum drive capacity
# (Note: although 5.25" HD drives can format disks at 1.44M, they're
listed
#        as 1200 because that's the common maximum size.)

#               size sec/t hds trk stre gap  rate spec1 fmt_gap
360/360          720     9   2  40    0 0x2A 0x02 0xDF     0x50
```

```
1200/1200       2400    15   2  80    0 0x1B 0x00 0xDF      0x54
360/720          720     9   2  40    1 0x2A 0x02 0xDF      0x50
720/720         1440     9   2  80    0 0x2A 0x02 0xDF      0x50
720/1440        1440     9   2  80    0 0x2A 0x02 0xDF      0x50
360/1200         720     9   2  40    1 0x23 0x01 0xDF      0x50
720/1200        1440     9   2  80    0 0x23 0x01 0xDF      0x50
1440/1440       2880    18   2  80    0 0x1B 0x00 0xCF      0x6C
...
```

The format you'll most likely be interested in is the 1440/1440 description of today's 3.5-inch high-density drives. If you don't have a 1.44MB floppy diskette, you can use a name (such as 360/360) from this file with the `setfdprm` (set floppy disk parameter) command (found in the `/usr/bin` directory) to associate your drive A: floppy with a device, such as `/dev/fd0`:

```
# setfdprm -p /dev/fd0 360/360
```

After that, you can proceed with a low-level format of your drive. To do this, you use the `fdformat` (floppy disk formatting) command (found in the `/usr/sbin` directory). To perform this operation on the default floppy device, a 1.44MB diskette, insert a blank diskette in your drive and then use

```
# fdformat /dev/fd0
Double-sided, 80 tracks, 18 sec/track. Total capacity 1440 kB.
Formatting ... done
Verifying ... done
```

Here, you've told the `fdformat` command to do a low-level format of the `/dev/fd0` device. Be careful! Be sure to specify the correct device.

You should also know that you can alternatively use a specific floppy device to do the low-level format, for example:

```
# fdformat /dev/fd0H1440
```

This tells `fdformat` to use the specific floppy device for high-density drives, in this case, the A: drive.

The next step is to create a filesystem on the floppy. You'll use the `mke2fs` command to make a Linux second extended filesystem on the floppy. The `mke2fs` command, found in the `/sbin` directory, has at least two dozen command-line options, but you'll only use a few, for example:

```
# /sbin/mke2fs -c -v -L "Linux1" /dev/fd0
mke2fs 1.10, 24-Apr-97 for EXT2 FS 0.5b, 95/08/09
Linux ext2 filesystem format
Filesystem label=Linux1
```

```
360 inodes, 1440 blocks
72 blocks (5.00%) reserved for the super user
First data block=1
Block size=1024 (log=0)
Fragment size=1024 (log=0)
1 block group
8192 blocks per group, 8192 fragments per group
360 inodes per group

Running command: badblocks -s /dev/fd0 1440
Checking for bad blocks (read-only test): done
Writing inode tables: done
Writing superblocks and filesystem accounting information: done
```

The preceding example uses the `-c` option to check the diskette for any bad blocks and the `-L` option to give the floppy a name. To see what's going on, it also used the `-v` (verbose mode) option. The `mke2fs` command will automatically determine the size of your floppy, check it using the `badblocks` command, found in the `/sbin` directory, and then create your Linux filesystem. You might also want to use the `-m` option with a value of `0` to have the most room available and specify the high-density floppy device (to override `mke2fs`'s `default behavior of` reserving five percent of the filesystem for the root operator):

```
# mke2fs -m 0 /dev/fd0H1440 1440
```

As a final step, you can mount the floppy, using the `mount` command, and then check the floppy's size, for example:

```
# mount -t ext2 /dev/fd0 /mnt/floppy
#  df /dev/fd0
Filesystem         1024-blocks  Used Available Capacity Mounted on
/dev/fd0                 1390      13      1377       1%   /mnt/floppy
```

I've shown you the formal `mount` command line to mount a floppy. However, because the floppy device is defined in the default OpenLinux filesystem table, `/etc/fstab`, you can simply mount a floppy with **`mount /mnt/floppy`**.

Knowing how to format floppy drives is important. If you use the K Desktop Environment, read the next section and learn how to use the KFloppy utility.

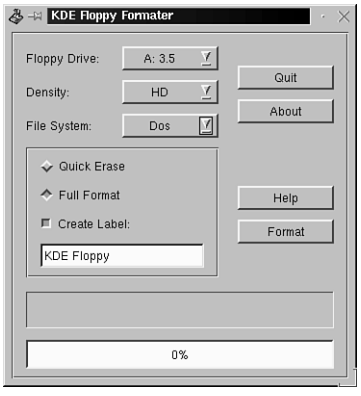
Formatting Floppies with the KFloppy Client

If you use X11 and KDE, you can format floppy diskettes with a point-and-click client called KFloppy. To start this client, click the Utilities menu on your desktop's panel and then click KFloppy on the pop-up menu. The KFloppy dialog will appear as shown in Figure 22.1.

You can also start KFloppy from the command line of a terminal window by typing **`kfloppy &`** and pressing Enter.

FIGURE 22.1

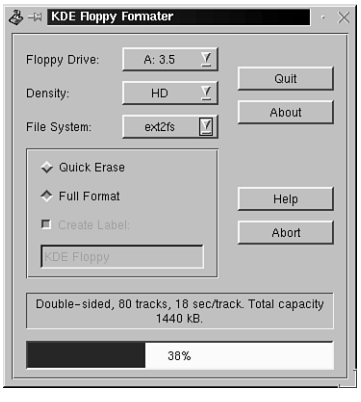
Use the KFloppy client to format floppies for the ext2 or DOS filesystems.



To format a floppy for Linux, click the File System pop-up menu and select ext2fs. The KFloppy dialog will automatically select a Full Format. Insert a floppy diskette and click the Format button to start formatting. A progress indicator will appear, as shown in Figure 22.2. Click the Abort button if you want to cancel formatting.

FIGURE 22.2

The KFloppy client shows a progress bar when formatting floppies.



When KFloppy finishes, it will display a dialog reporting whether the floppy was formatted, how many bad blocks, if any, were found, and the raw capacity (in bytes) of the formatted diskette. (Bad floppies should be discarded.) To format a floppy for DOS, click the File System pop-up menu and select DOS. You can then click Quick Erase (for already formatted disks) or Full Format for the diskette. You can also type a volume label of up to 11 characters. Click the Format button to start the format.

Fortunately, the `kfloppy` client will report an error if you try to format a mounted floppy. You must unmount your floppy with `umount /mnt/floppy` before attempting to format additional floppies.

If you're only interested in DOS floppies, you'll want to explore the `mtools` package, discussed next.

The `mtools` Package

The `mtools` package is a set of programs you can use in just about any operation on MS-DOS floppies. These commands are useful because you don't need to mount the floppy in order to read, write, or make changes to the floppy's contents. These utilities include

- `mattrib`—Change file attributes
- `mbadblocks`—Floppy testing program
- `mcd`—Change directory command
- `mcheck`—Check a floppy
- `mcopy`—Copy files to and from diskette
- `mdel`—Delete files on diskette
- `mdeltree`—Recursively delete files and directories
- `mdir`—List contents of a floppy
- `mformat`—Format a floppy
- `minfo`—Categorize and print floppy characteristics
- `mkmanifest`—Restore Linux filenames from floppy
- `mlabel`—Label a floppy
- `mmd`—Create subdirectory
- `mmount`—Mount floppy
- `mmove`—`mv` command for floppy files and directories

- `mpartition`—Make DOS filesystem as partition
- `mrd`—Delete directories
- `mren`—Rename a file
- `mtoolstest`—Test `mtools` package installation
- `mtype`—Types (lists) a file
- `mzip`—Zip/Jaz drive utility
- `xcopy` —Copy one directory to another

This hour won't cover all these utilities, but from the list, you should be able to see that the most often used are the `mformat`, `mdir`, `mcopy`, and `mdel` commands. The `mformat` command will format nearly any type of floppy device. One nice feature of this package of software is that you don't have to remember the specific names of floppy devices, such as `/dev/fd0`, and you can use the (possibly) familiar A: or B: drive designators. For example, to format a floppy in your drive A:, you would use

```
# mformat a:
```

This will automatically format your diskette. After the `mformat` command has finished, you can copy files to and from the diskette with the `mcopy` command, for example:

```
# mcopy *.txt a:
```

This will copy all files ending in `.txt` to your diskette. To copy files from your diskette, just reverse the arguments (in DOS form) to the `mcopy` command:

```
# mcopy a:*.txt
```

This will copy all files ending in `.txt` to the current directory or a directory you specify. To see what is on the diskette, use the `mdir` command, for example:

```
# mdir a:x*.*
 Volume in drive A has no label
 Directory for A:/

xena     msg      8708 11-21-1997  12:14p xena.msg
xgames   msg      2798 11-21-1997  12:14p xgames.msg
xrpm     msg      3624 11-21-1997  12:14p xrpm.msg
        3 file(s)            15 130 bytes
                          1 067 008 bytes free
```

To label the diskette, you can use the `mlabel` command, for example:

```
# mlabel a:
 Volume has no label
Enter the new volume label : LINUX
```

You can also use special shell command-line quoting to label the diskette from the command line:

```
# mlabel a:'DOS DISK'
```

This is a handy way to use spaces in a diskette's label. If you want to delete files on your diskette, use the `mdel` command:

```
# mdel a:*.txt
```

This will delete all files ending in `.txt` on the diskette in the A: drive. If you need to perform more than these basic operations (such as use the floppy as a destination in an OpenLinux command line), you can also mount your diskette. For details, see the `mmount` manual page, along with the `mount` command manual page.

Now that you know how to manage different filesystems, the next section covers how to manage your files.

Managing File Ownership and Permissions

Managing files in Linux means more than moving files around the file system or keeping files grouped by similar behavior or topic. You can change which user or group owns a file or directory and whether you, your group, or others can read, write, or execute (run) your files.

The `chmod` (change access permissions) command, found in the `/bin` directory, is used to give or take away permission of groups or others to your files. Before you can begin to use the `chmod` program, you should understand Linux files and how Linux handles file permissions. In Hour 4, "Reading and Navigation Commands," you learned how to get a long-format directory listing using the `-l` option with the `ls` (list) command. This option shows the mode and permissions flags of files, for example:

```
# ls -l book/*doc
-rw-r--r--   1 bball    bball       78073 Nov 16 19:58 book/24hr06or.doc
-rw-r--r--   1 bball    bball       52287 Nov 16 19:57 book/24hr11or.doc
```

The mode and permissions flags for directories and files are listed in the first 10 columns and consist of a sequence of 10 letters. (See the section "Reading File Permissions Flags" later in this chapter.) The first letter tells you the type of file.

Understanding Linux File Types

There are at least eight file types in Linux, but these are the four most common ones:

- `b`—Block device (such as a hard drive)
- `c`—Character device (such as a serial port)
- `d`—Directory (also a file)
- `l`—Symbolic link (a small file pointing to another)

You'll usually find block and character devices in the `/dev` directory. Your modem or printer port on your PC will probably be a character device, whereas your floppy drive is a block device, for example:

```
# ls -l /dev/lp0 /dev/ttyS1 /dev/fd0
brw-rw-rw-   1 root     root       2,   0 Aug 19 04:22 /dev/fd0
crw-rw----   1 root     lp         6,   0 Aug 19 04:22 /dev/lp0
crw-rw-rw-   1 root     uucp       4,  65 Nov 24 13:46 /dev/ttyS1
```

As you can see, the different devices have either a `b` or a `c` in front of the permissions flags (denoting a block or character device). You can also use the `ls` command to list the permissions of a directory, using the `-d` (directory) option, for example:

```
# ls -ld book
drwxrwxr-x   2 bball    bball        1024 Nov 18 19:35 book
```

The `d` in the permissions flag denotes a directory. Symbolic links will also have designated type `l` in the `ls -l` listing, for example:

```
# touch file1
# ln -s file1 file2
# ls -l file2
lrwxrwxrwx   1 bball    bball           5 Nov 23 11:14 file2 -> file1
```

Now that you understand some of the basic file types, the next section shows you how to read the permissions flags.

Reading File Permissions Flags

Although the permissions sequence of letters might seem cryptic and mysterious at first, you can easily decipher what these mean. To do this, break the sequence of nine characters into three groups of three. Each group of characters represents (from left to right)

`r`—The file can be read.

`w`—The file can be written to.

`x`—The file can be executed, or run, or in the case of a directory, searched.

The first group of three characters is for the owner. If you create the file, you can change any of these permissions. The next group of three characters is for the group. If you recall the discussion of the `/etc/passwd` file in Hour 21, "Basic System Administration," you know that by default, you are assigned to two groups when your account is first created, one with your name and the other to the group users. As the system administrator, or sysadmin, you can organize users on your system by assigning users to different groups.

You'll find a list of groups for your Linux system in the `group` file in the `/etc` directory. This file contains a text database of groups. Here are a few sample entries:

```
root::0:
wheel::10:
bin::1:bin,daemon
daemon::2:bin,daemon
sys::3:bin,adm
adm::4:adm,daemon
...
users::100:bball,cloobie
bball::500:bball
cloobie::502:cloobie
```

The format of the `/etc/group` file is group, password, group number, and a comma-delimited list of users who belong to the group. This means that you can assign read, write, or execute permissions to your group and allow or deny access to your files. As the root operator, or sysadmin, you can organize your users into different groups. This is important and is one of the reasons you might need to use the `chown` (change ownership) command, as you'll see later in this hour.

The final set of three characters denotes the read, write, and execution permissions you grant all other users. Now that you know how to read the permissions, take a look at some examples before moving on to the `chmod` program.

When you create a file, by default, you and the members of your group have read and write permissions on that file. You can change the default of file creation permissions with your shell's `umask` command. (See your shell's manual page for details.) Here's a simple example:

```
# touch myfile
# ls -l myfile
-rw-r--r--   1 bball    users           0 Dec 26 09:29 myfile
```

This shows that only you (`rw-`) can read and write the file `myfile`, whereas your group (`r--`) and all others (`r--`) can only read the file. If `myfile` were available to everyone on your system, the permissions would look like this:

```
-rw-rw-rw-   1 bball    users           0 Dec 26 09:29 myfile
```

Now, anyone (`rw-`) can read or write this file. If `myfile` were only available for reading and writing to you, the permissions would look like this:

```
-rw-------   1 bball    users           0 Dec 26 09:29 myfile
```

This shows that you (`rw-`), but not your group (`---`) or others (`---`), can read the file. How do you change these settings? You use the `chmod` command.

Changing File Permissions with the `chmod` Command

You can use the `chmod` command in several ways to change file or directory permissions. Learning how to use this command is not as easy as 1-2-3, but it is as easy as 4-2-1!

You can use the `chmod` command in at least two different ways. Although you can use `chmod` to create simple commands from text files, using the `+x` command-line option (as you learned in Hour 6, "Using the Shell"), you might want to set exact permissions of certain files in your home directory, or as the sysadmin, of critical files on your system. The `chmod` command uses octal, or base eight, notation in modifying file or directory permissions. The 4-2-1 sequence corresponds to the three `rwx` sequences in the permissions flags.

How does this work? Well, suppose you want to make one of your files private so that no one else (except the root operator, of course) can read or write your file. When you first create the file, perhaps you and your group can read and write the file, whereas others can only read it. Knowing that 4-2-1 matches `rwx`, and knowing that the group and others permissions follow your permissions in the permissions flag, you can use `chmod` with the octal number `600` to change the permissions:

```
# chmod 600 afile
# ls -l afile
-rw-------   1 bball    users           0 Dec 26 14:50 afile
```

This makes the file readable and writable only by you because you've enabled read (4) + write (2) for yourself and no one else. To change the file permissions back to the original access permissions, you would want to enable read (4) + write (2) for you (6) and your group (6) and read-only permissions for all others (4), and use the octal number 664:

```
# chmod 664 afile
# ls -l afile
-rw-rw-r--   1 bball    users           0 Dec 26 14:50 afile
```

You can also change file directory permissions and either let other people list the contents of your directory or have access only to the files in a directory and not be able to list the directory contents. For example, to protect a directory from prying eyes (again, from everyone but the root operator), you can try

```
# mkdir temp
# cd temp
# touch file1 file2 file3
# cd ..
# chmod 700 temp
# ls -ld temp
drwx------   2 bball    users        1024 Dec 26 14:52 temp
```

If anyone else tries to look into your directory, they will see

```
# ls /home/bball/temp
ls: /home/bball/temp: Permission denied
```

What if you want to allow others to read files in the directory without being able to list the contents? To do this, you can enable execute permission of your directory:

```
# chmod 711 temp
# ls -ld temp
drwx--x--x   2 bball    users        1024 Dec 26 14:52 temp
```

Now, no other users will be able to list the contents of your directory but can read files that you tell them are within. For example:

```
# ls -l /home/bball/temp
ls: /home/bball/temp: Permission denied
# ls -l /home/bball/temp/file1
-rw-r--r--   1 bball    users           0 Dec 26 14:52
/home/bball/temp/file1
```

As you can see, using the `chmod` command's octal notation is not hard. What you have to decide is to whom you want to grant access and what kind of access you'd like your files to have. The `chmod` command also has a command-line form:

```
ugoa +-= rwxXstugo
```

This book doesn't go into all the details of this notation (you can read the `chmod` command's manual page for more details), but the next few examples duplicate `chmod`'s actions using the previous examples. You can protect a file from anyone else with

```
# ls -l file1
-rw-r--r--   1 bball    users           0 Dec 26 14:52
/home/bball/temp/file1
# chmod go-rwx file1
# ls -l file1
-rw-------   1 bball    users           0 Dec 26 14:52 file1
```

As you can see, the file is now readable and writable only by you because you have specified that your group (`g`) and others (`o`) do not (`-`) have read, write, or execute (`rwx`) permission. Now, you can protect your directory from prying eyes as follows:

```
# chmod go-rwx temp
```

To mimic the last example, to enable others to read files in the directory but not list the directory contents, you can use

```
# chmod go+x temp
```

You're now familiar with file and directory permissions and using the `chmod` command. The next section shows how you can change ownership of files or directories using the `chown` command.

Changing File Ownership with the `chown` Command.

The `chown` (change ownership) command, found in the `/bin` directory, is used to change, either permanently or temporarily, the ownership of files or directories. If you recall the previous discussion of the `/etc/group` file in this hour, you'll remember that your users can be assigned to different groups. Using the `chown` command, you can assign ownership to different users or groups, permitting reading, writing, or deletion of files and directories.

For example, if you've created a text file, you can share it with members of your group or others with the `chmod` command. By using `chown`, you can tell Linux specifically what other users or groups can have access to your file. You can use the `groups` command to find out what groups you belong to:

```
# groups
users
```

This shows that the user, `bball`, belongs to the group `users`. As the root operator, you belong to the group `root`, for example:

```
# groups
root
```

To find out who belongs to a group, look at the `/etc/group` file, or use the name of a user:

```
# groups cloobie
cloobie : users
```

This shows that `cloobie` belongs to at least one group, called `users`. To assign one of your files to the users group, and give `cloobie` access, you can use the `chown` command's syntax of *`user:group`*:

```
# chown :users myfile
# ls -l myfile
-rw-r--r--   1 bball    users           0 Dec 26 15:19 myfile
```

You might think that to assign specific ownership, you can use the following:

```
#  chown cloobie:users myfile
chown: myfile: Operation not permitted
```

What happened? This shows why Linux has groups. You can assign access of one of your files to a group, but unless you're the root operator, you cannot assign one of your files to appear to have been either created by or owned by another user. Make sure you're logged in as the root operator, and use

```
# chown cloobie:cloobie myfile
# ls -l myfile
-rw-rw-r--   1 cloobie  cloobie         0 Dec 26 15:19 myfile
```

As you can see, even though the file `myfile` was created by the user bball, as the sysadmin, you can assign ownership to any users and any group. If you just want to change the group ownership of a file or directory, you can use the `chgrp` command, and if you want to change your users or your own group, you can use the `newgrp` command.

Changing Groups and Ownerships with the `chgrp` and `newgrp` Commands

The `chgrp` (change group) command, found in the `/bin` directory, is used only to change group ownerships. In this regard, it is not as flexible as the `chown` command, which can do both. The `chgrp` command accepts a group name or group ID (GID), for example:

```
# ls -l myfile
-rw-r--r--   1 bball    users           0 Dec 26 15:26 myfile
```

This shows that the file belongs to user `bball` and group `users`. To change the group ownership and grant access to other members of the group, use

```
# groups bball
bball : bball users
# chgrp users myfile
# ls -l myfile
-rw-rw-r--   1 bball    users           0 Nov 23 14:16 myfile
```

Now, other members of the users group can access the file. Along with the `chgrp` command, you can use the `newgrp` command, which is found in the `/usr/bin` directory. Although the `chgrp` command will change group ownership of one of your files or directories to a group you belong to (or if you're the root operator, any group), you can use `newgrp` to shift your current group membership:

```
# groups
bball users
# touch file1
# ls -l file1
-rw-rw-r--   1 bball    bball           0 Nov 23 14:53 file1
# newgrp users
# groups
users bball
# touch file2
# ls -l file2
-rw-rw-r--   1 bball    users           0 Nov 23 14:54 file2
# newgrp bball
```

This shows that the user `bball` originally belonged to the default group `bball`. This was verified by creating a file showing the current user and group ownership. Next, the user `bball` changed to the users group, created a file, and verified that the created file has the new group's access. Finally, the user `bball` changed back to the original group, `bball`.

The `newgrp` command will launch a new shell, and you must use the shell's `exit` command to return to your original prompt. If you only need to run a single command as the member of a different group, use the `sg` command, which will not replace your shell.

As you can see, Linux offers you a great deal of flexibility in assigning file ownerships and permissions. By using different combinations of directory and file ownership and permissions, you can organize your system along lines of types of work, types of users, or types of files.

Managing Linux Software with `rpm`, `lisa`, and `kpackage`

NEW TERM Software installation and removal under OpenLinux is accomplished with the Red Hat Package Manager, or `rpm` command. The `rpm` command works by using *software packages* and databases of installed software for your system under the **`/var/lib/rpm`** directory. A software package is an archive of files, information, and scripts used before and after files are decompressed and saved into your file system. The `rpm` command, its databases, and the format of the software packages are the *backend* system for *front-end* utilities such as `lisa` and the `kpackage` client.

This section introduces you to the `rpm` command and then shows you how to use the `kpackage` client and the `lisa` command to install or remove software.

Using the `rpm` Command

You use the `rpm` command to install, query, upgrade, uninstall, and verify software. What makes `rpm` so handy is that you can use it to easily track what software is installed and which version of a software package is installed and then upgrade the software package, and if desired, uninstall the software—all with a single command line!

The `rpm` command has many different command-line options, but most users will only use five of its options, or modes:

- `-i`, or install
- `-e`, or uninstall
- `-q`, or query
- `-U`, or upgrade
- `-V`, or verify

To install a software package (usually with a filename ending in `.rpm`), use the `-i` option, followed by the name of a software package. Software package names usually include the name of the program, its version, what computer platform the software is designed for, and an `.rpm` extension. You must be logged in as the root operator or have root permission before installing or removing software. For example, to install the `taper` backup software package from your OpenLinux CD-ROM, insert and mount the CD-ROM and then use `rpm`:

```
# rpm -i /mnt/cdrom/Packages/RPMS/taper-6.8.2-2.i386.rpm
```

To have `rpm` report on what it is doing, using the `-v` or verbose secondary option. If you'd like to see a progress indicator, which prints hash signs (`#`) (hence the `-h` name for the option) during the installation, also use the `-h` option like this:

```
# rpm -ivh /mnt/cdrom/Packages/RPMS/taper-6.8.2-2.i386.rpm
taper                ##################################################
```

The software package components will be extracted and copied to the proper directories in your OpenLinux file system. After a successful installation, the `rpm` databases will then be updated to include the new software. To verify that the taper software has been installed, use the `-V`, or verify option:

```
# rpm -V taper
```

Everything is okay if nothing happens. However, if any files in the taper package have changed in size, ownership, or permission, you'll receive various error messages. To find out more about a package, either before or after installing the software, use `rpm`'s `-q`, or query option. For example, to see a description of the taper software package after installation, use the `-q` option, along with the secondary `i` or information option:

```
# rpm -qi taper
Name        : taper                         Distribution: OpenLinux 1.3
Version     : 6.8.2                         Vendor: Caldera, Inc.
Release     : 2                             Build Date: Wed Aug 19 06:11:40
1998
Install date: Mon Dec 28 14:02:03 1998    Build Host:
buildmeister.caldera.com
Group       : Administration/Archiving    Source RPM: taper-6.8.2-
2.src.rpm
Size        : 425903
Packager    : Raymund Will <ray@lst.de>
URL         : http://www.multiline.com.au/~yusuf/
Summary     : Menu driven backup system with support for compression.
Description :
This is a tape backup and restore program that provides a friendly user
interface to allow backing/restoring files to a tape drive. Alternatively,
files can be backed up to hard disk files. Selecting files for backup and
restore is very similar to the Midnight Commander interface and allows
easy
traversal of directories. Recursively selected directories are supported.
Incremental backup and automatic most recent restore are defaults
settings.
SCSI, ftape, zftape, and removable drives are supported

WARNING: Please note that this is BETA software.
```

To query a software package before installation, use the `-q` option along with `-i` and the `-p`, or package file option, followed by the pathname to the package like this:

```
# rpm -qpi /mnt/cdrom/Packages/RPMS/taper-6.8.2-2.i386.rpm
```

You'll see the same information as shown in the previous example. Do you want to see what commands, files, or documentation are included in a package before installation? Use `-q` along with the `-l` option:

```
# rpm -qpl /mnt/cdrom/Packages/RPMS/taper-6.8.2-2.i386.rpm
/sbin/bg_backup
/sbin/bg_restore
/sbin/taper
/usr/doc/taper-6.8.2
/usr/doc/taper-6.8.2/BUGS
/usr/doc/taper-6.8.2/CHANGES.html
/usr/doc/taper-6.8.2/COMPRESSION
/usr/doc/taper-6.8.2/COPYING
/usr/doc/taper-6.8.2/CREDITS
/usr/doc/taper-6.8.2/FAQ.txt
/usr/doc/taper-6.8.2/VERSION6.8
/usr/doc/taper-6.8.2/WARNING
```

You can also use `rpm`'s `-U`, or upgrade option, to upgrade, overwrite, and replace existing software with newer versions. For example, to upgrade to a new version of the `taper` command, use the `-U` option:

```
# rpm -U taper-6.8.4-2.i386.rpm
```

Deleting software can be a daunting task; many programs have configuration files, support libraries, or documentation scattered about the file system. However, if you use `rpm`, you can easily remove software with a single command line. For example, to remove the package for `taper`, use the `-e`, or erase option, followed by the name of the program:

```
# rpm -e taper
```

Note that this is not the same as the name of software's `.rpm` file! The `rpm` command will also check, before removing software, whether the software you're going to remove will cause problems for other software packages. If this is the case, `rpm` will report a *dependency* error. This occurs because another package may depend on the installed software.

If you're worried about installing or removing software, use `rpm`'s `--test` option. To see exactly what `rpm` will do, also include the `vv`, or ultra-verbose, option. For example, to see exactly what `rpm` will do when it removes the `taper` software without removing the software, use a command like this:

```
# rpm -test -evv taper
D: counting packages to uninstall
D: opening database in //var/lib/rpm/
D: found 1 packages to uninstall
D: uninstalling record number 88728
D: will remove files test = 1
D: /usr/doc/taper-6.8.2/WARNING - removing
D: /usr/doc/taper-6.8.2/VERSION6.8 - removing
D: /usr/doc/taper-6.8.2/FAQ.txt - removing
D: /usr/doc/taper-6.8.2/CREDITS - removing
D: /usr/doc/taper-6.8.2/COPYING - removing
D: /usr/doc/taper-6.8.2/COMPRESSION - removing
D: /usr/doc/taper-6.8.2/CHANGES.html - removing
D: /usr/doc/taper-6.8.2/BUGS - removing
D: /usr/doc/taper-6.8.2 - removing
D: /sbin/taper - removing
D: /sbin/bg_restore - removing
D: /sbin/bg_backup - removing
D: removing database entry
```

Using `kpackage`

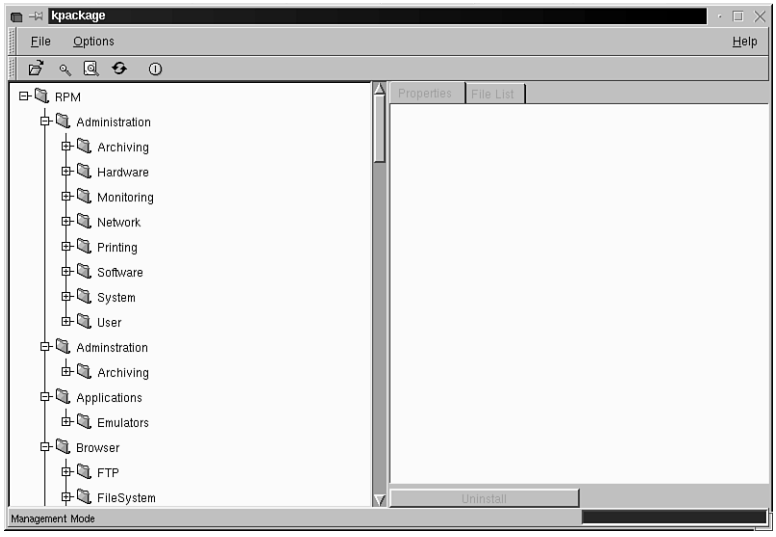
The `kpackage` client, included with the K Desktop Environment, or KDE, is a graphical interface to the `rpm` program and runs under the X Window system. You must be logged in as the root operator in order to use `kpackage` to install and remove software. As with other root-permission commands, if you're not logged in as the root operator, start the client from the command line of an X11 terminal window:

```
# su -c kpackage
```

This will start `kpackage`, and its window will list the groups of packages installed on your system (as shown in Figure 22.3).

FIGURE 22.3

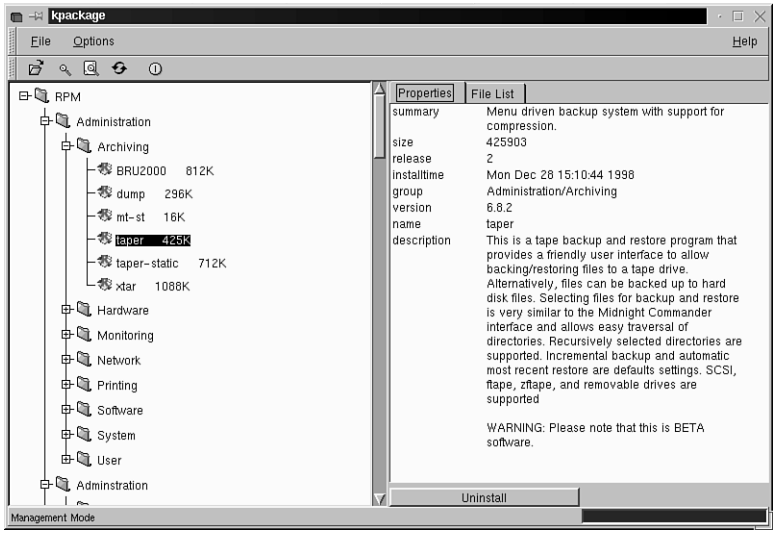
The `kpackage` *client, included with KDE, runs under X11 and uses the* `rpm` *command's databases to display installed software in your OpenLinux system.*



Note that your OpenLinux software is grouped under separate folders. Click the small plus (+) sign in front of the Archiving folder under Administration and then click the taper icon. A description of the package will appear, as shown in Figure 22.4.

FIGURE 22.4

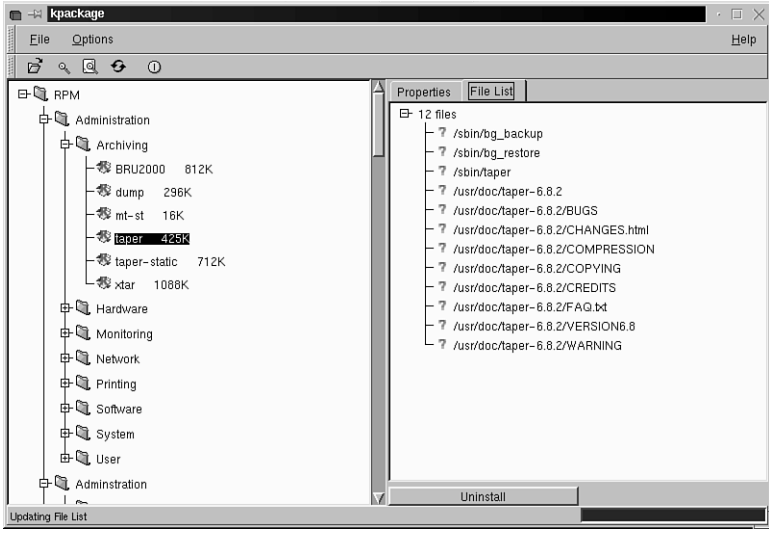
The `kpackage` *client displays information about an installed package from your system's* `rpm` *database.*


kpackage
File
Options
Help
RPM
Administration
Archiving
BRU2000 812K
dump 296K
mt-st 16K
taper 425K
taper-static 712K
xtar 1088K
Hardware
Monitoring
Network
Printing
Software
System
User
Adminstration
Properties
File List
summary Menu driven backup system with support for compression.
size 425903
release 2
installtime Mon Dec 28 15:10:44 1998
group Administration/Archiving
version 6.8.2
name taper
description This is a tape backup and restore program that provides a friendly user interface to allow backing/restoring files to a tape drive. Alternatively, files can be backed up to hard disk files. Selecting files for backup and restore is very similar to the Midnight Commander interface and allows easy traversal of directories. Recursively selected directories are supported. Incremental backup and automatic most recent restore are defaults settings. SCSI, ftape, zftape, and removable drives are supported
WARNING: Please note that this is BETA software.
Uninstall
Management Mode

If you click the File List tab, a listing of each file in the taper package and the file's location in your Linux file system will appear, as shown in Figure 22.5. To uninstall the software, click the Uninstall button at the bottom of the file information or file list.

FIGURE 22.5

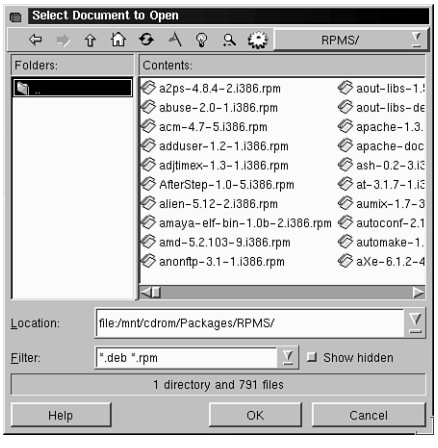
The kpackage *client displays the name of each file in an installed package and offers a one-click Uninstall button to remove software.*



To install a package, select the File menu and then click the Open menu item. The kpackage file selection dialog will appear as shown in Figure 22.6. If your OpenLinux CD-ROM is inserted and mounted, you can navigate to the RPMS directory and install by double-clicking its name.

FIGURE 22.6

The kpackage *client installs software using drag-and-drop or through a file selection dialog.*



Using the `lisa` Command

The `lisa` command is not only a graphical interface program to most OpenLinux system administration tasks, but also can install or remove software. Again, you must be logged in as the root operator in order to install and remove software using `lisa`. However, you do not need to run X11.

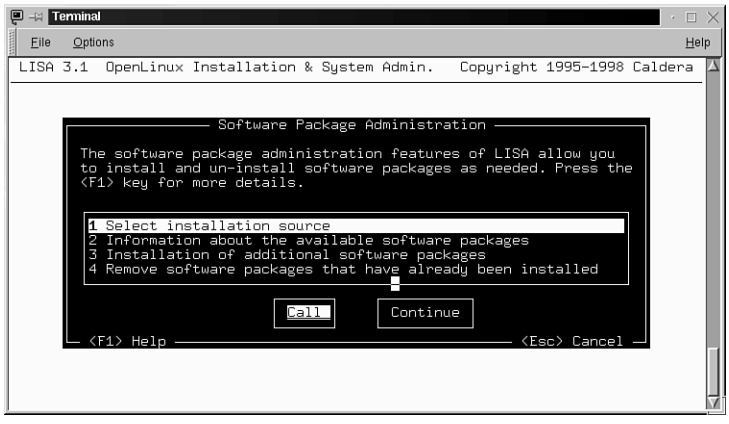
To jump right into software package management, start `lisa` from the command line with its `--pkg` option:

```
# lisa --pkg
```

The `lisa` dialog will appear as shown in Figure 22.7.

FIGURE 22.7

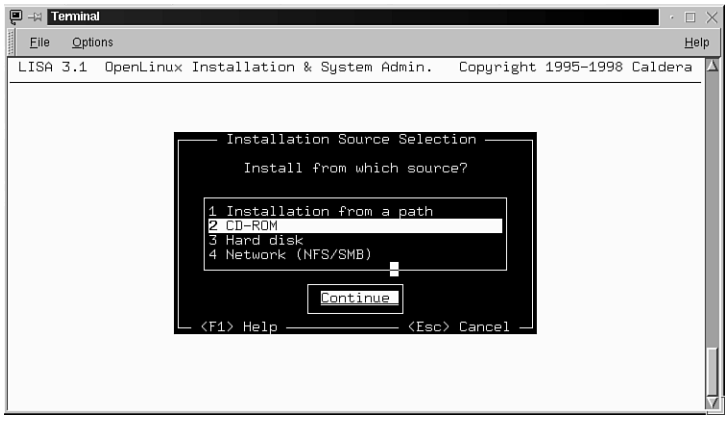
You can also use the `lisa` command to install or remove OpenLinux software.


Terminal
File Options Help
LISA 3.1 OpenLinux Installation & System Admin. Copyright 1995-1998 Caldera
Software Package Administration
The software package administration features of LISA allow you to install and un-install software packages as needed. Press the <F1> key for more details.
1 Select installation source
2 Information about the available software packages
3 Installation of additional software packages
4 Remove software packages that have already been installed
Call
Continue
<F1> Help
<Esc> Cancel

To install a software package, you must first select the directory or filesystem. Press Enter to choose where the software package is located. A selection dialog will appear, as shown in Figure 22.8.

FIGURE 22.8

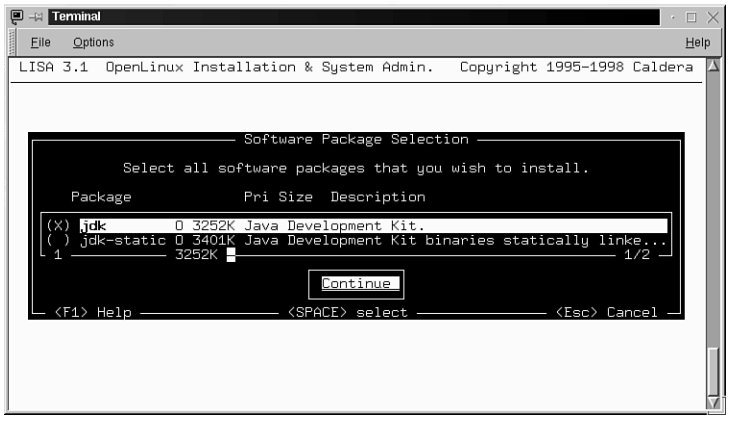
To install software with `lisa`, you must first choose where the package is located.



If you select CD-ROM, `lisa` will try to first detect your CD-ROM (you should mount the CD-ROM first), confirm your CD-ROM, and then present the initial dialog (as shown in Figure 22.7) with the software installation line (line number 3) highlighted. Press Enter to go to the Installation dialog, shown in Figure 22.9.

FIGURE 22.9

The `lisa` *command uses a scrolling list of files in its software installation selection dialog.*

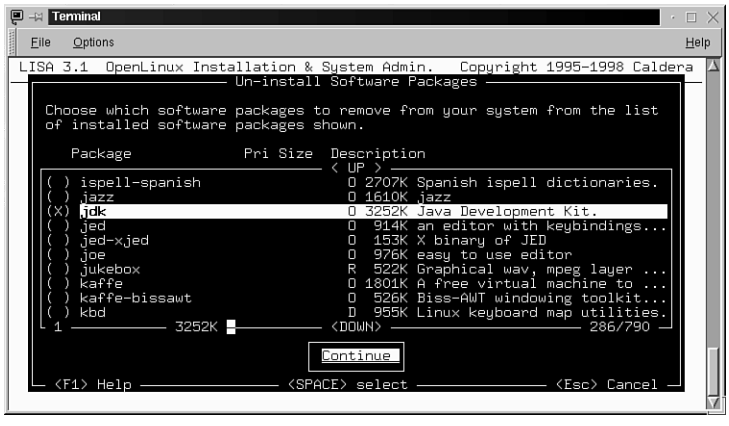

Terminal
File Options Help
LISA 3.1 OpenLinux Installation & System Admin. Copyright 1995-1998 Caldera
Software Package Selection
Select all software packages that you wish to install.
Package Pri Size Description
(X) jdk O 3252K Java Development Kit.
( ) jdk-static O 3401K Java Development Kit binaries statically linke...
1 3252K 1/2
Continue
<F1> Help <SPACE> select <Esc> Cancel

A list of available packages is displayed after the list of `.rpm` files on your CD-ROM are compared against the list of installed `.rpm` files in your OpenLinux system's `rpm` database. To select a file, scroll through the list and press the spacebar. When finished, press Enter to install the software.

To remove software, select the software removal item in the main software administration dialog (as shown in Figure 22.7) and press Enter. You'll see a list of installed packages on your system (as shown in Figure 22.10). To remove a package, scroll through the list and press the spacebar. When finished, press Enter to remove the software.

FIGURE 22.10

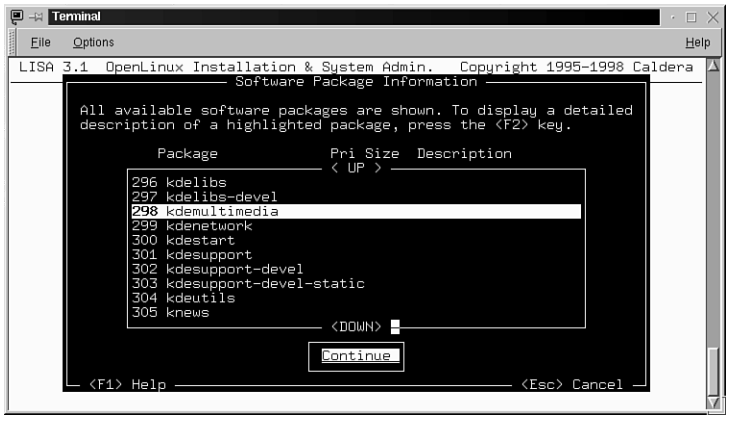
The `lisa` *command uses a scrolling list of files in its software removal dialog.*


Terminal
File Options Help
LISA 3.1 OpenLinux Installation & System Admin. Copyright 1995-1998 Caldera
Un-install Software Packages
Choose which software packages to remove from your system from the list of installed software packages shown.
Package Pri Size Description
< UP >
( ) ispell-spanish O 2707K Spanish ispell dictionaries.
( ) jazz O 1610K jazz
(X) jdk O 3252K Java Development Kit.
( ) jed O 914K an editor with keybindings...
( ) jed-xjed O 153K X binary of JED
( ) joe O 976K easy to use editor
( ) jukebox R 522K Graphical wav, mpeg layer ...
( ) kaffe O 1801K A free virtual machine to ...
( ) kaffe-bissawt O 526K Biss-AWT windowing toolkit...
( ) kbd D 955K Linux keyboard map utilities.
1 3252K <DOWN> 286/790
Continue
<F1> Help <SPACE> select <Esc> Cancel

To get information about a package, select the information line item in the main software package administration dialog (as shown in Figure 22.7) and press Enter. The `lisa` command will then query your system's `rpm` database and show a list of package names, as shown in Figure 22.11.

FIGURE 22.11

To get information about a package, scroll through the list of installed software, select a file, and press Enter.



Scroll through the list and select a package with the spacebar, and then press Enter to see the package information. This information is exactly the same as shown by the `rpm` command's `-qi` options.

OpenLinux also includes the Caldera Open Administration System, which features, another graphical interface to your system's `rpm` database. COAS requires X11, and uses a large window you can use to install and remove software.

Summary

This hour introduced you to the concept of the OpenLinux file system, or the organization of directories and files for Linux. You also learned about different filesystems and how to read your OpenLinux filesystem table, `fstab` in the `/etc` directory. In addition, you learned how to read and change file ownership and permissions. You also found out how to query, install, and remove software from your system using three different utilities. All these skills are an important part of knowing how to administer, maintain, and troubleshoot OpenLinux.

Q&A

Q **I tried formatting a floppy with the `fdformat` command. After I inserted a floppy, typed the command, and specified the `/dev/fd0` device, the command reported `Could not determine current format type: No such device`. I know my floppy works. What's going on?**

A It's possible that you didn't have a floppy inserted in the drive. If you get this error with an inserted floppy, the floppy was not blank and was previously formatted. The best approach to use when performing a low-level format is to specify the exact type of device (such as `/dev/fd0H1440`) as in `fdformat /dev/fd0H1440`.

Q **How do I create a folder for my KDE desktop xe "KDE (K Desktop Environment):desktop" xe "K Desktop Environment (KDE):desktop" that, when opened, shows the contents of my Windows partition?**

A Mount your Windows partition xe "Windows partition:mounting" and then create a symbolic link xe "symbolic links" with a name such as `dos` inside the Desktop folder in your home directory. Make sure this link points to the Windows desktop folder—for example, `ln -s /mnt/dos/windows/desktop $HOME/Desktop/dos`.

Exercises

1. Format a floppy and then prepare the diskette with the Linux ext2 filesystem . Mount the floppy and copy files from your home directory to the diskette. What utilities did you use?
2. Make a backup of your system's filesystem table and copy it to a diskette. Then, edit your filesystem to allow others to mount and unmount CD-ROMs.
3. Open the KDE help application from your desktop's panel and then click the Using Templates to access Applications and Devices item. Follow the directions and create a desktop icon for your floppy drive. After you finish, copy files to your floppy by dragging them from your home folder.

HOUR 23

Backing Up and Restoring Your System

This hour continues the discussion of basic system administration skills and shows you how, as the root operator, to back up and restore your system using several different Linux utilities. With a little practice, you can easily perform these system administration tasks.

Considerations Before Performing Backups and Restores

There are several things to consider before backing up or restoring your system. Although one ideal time to back up is after you install Linux and make sure all your devices (such as the sound card, graphics card, or tape drive) are working, there are other considerations. For example, if the kernel supplied on the CD-ROM works well for your system, you can simply rely on the CD for your initial backup if you have to do a full restore.

There is a difference between a backup and an archive. Backups are performed at regular intervals to save important documents, files, or complete systems. Archives are made to save important documents, files, or complete systems for long periods of time. This means that you should first devise a backup strategy and ask yourself the following questions:

- Do I need to use a formal backup strategy?
- Do I need to back up the entire system each time?
- Do I need to back up selected files or whole directories?
- How often should I back up?
- How long do I need to keep my archived copies?
- Do I need reports or statistics on the backups?
- What media (such as floppy, tape, or removable hard drive) should I use?
- What software format (such as tar or dump) should the backup be in?
- Do I need to use any specialized software tools, such as backup scripts, or can I perform the backups by hand?
- Should compression, straight copy, or encryption be used?

You can answer some of these questions by looking at the way you use OpenLinux. If you just use Linux for word processing or running spreadsheets, you can probably get away with only backing up certain files or directories. If you use Linux to learn programming, keep original copies of your programs, along with different versions. If you have other users on the system, save not only copies of their directories, but the `/etc/passwd` file, portions of the file system that take a long time to recreate (such as the entire `/etc` directory), or even the whole system. Do this so that you can quickly restore the system in the event of a hard drive crash (unlikely) or system operator error (more likely).

The size of your system and the capacity of your hard drives or other storage devices might be determining factors in approaching a backup strategy. If your Linux system is small enough (around 200MB), you can quickly back up everything to another hard drive or a tape drive. You also can use a removable media drive, such as an Iomega Zip or Jaz drive or Syquest EZ-flyer. If you only have to save copies of a small number of small files, you might even be able to use high-density floppies for storage.

You'll probably decide on a combination of archiving and regularly scheduled full or incremental backups. You need to choose software to use and explore how to automate as much of the process as possible, perhaps by using `crontab` entries (discussed in Hour 24, "Using Scheduling to Automate System Management"). Whatever you do, when you decide on your strategy, stick to it! The worst time to create and use a backup strategy is after you run into problems or lose files.

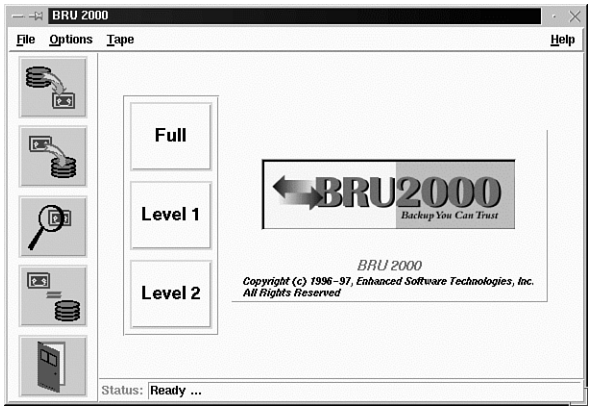
Configuring the BRU Backup System for Backups and Restores

You can download a free copy of Enhanced Software Technologies' BRU 2000 PE by browsing to `http://www.estinc.com`. This is a complete personal edition of a commercial software backup application you can use to back up your system or files using nearly any tape drive, removable hard drive, and even floppies. This section shows you how to configure BRU 2000 PE and highlight selected features of this software, which provides data verification, error detection, data compression, and selective backup and restores.

The BRU 2000 PE software included with this book's CD-ROM is exactly the same as the commercial version of BRU 2000 but does not support the same features (such as network backups). The personal edition is quite adequate for backup operations on a desktop OpenLinux system.

FIGURE 23.1

The BRU 2000 backup and restore utility features menus and buttons to manage Linux system backups.



Install the BRU software by using the `lisa`, `rpm`, `glint` or `kpackage` programs (see Hour 22, "Handling Files and Your File System"). The software is installed into the `/bru` directory in your file system.

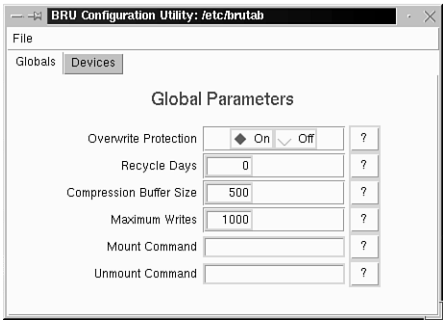
You can use the BRU software from the command line or during an X11 session. Using BRU with X is a lot easier, but you can perform backup operations from the command line of a console. BRU has more than 50 command-line options you can use to specify for your backup process. To use BRU at the command line, type `bru [options]`. To start the X interface, type `xbru` in an xterm window. See BRU's man page for details.

When you first run BRU, you must also tell BRU which device to use to back up your files. First, pull down the File menu with your mouse, and then select the Configure BRU menu item. A window called BRU Configuration Utility appears, as shown in Figure 23.2.

You must run BRU as the root operator in order to configure the software.

FIGURE 23.2

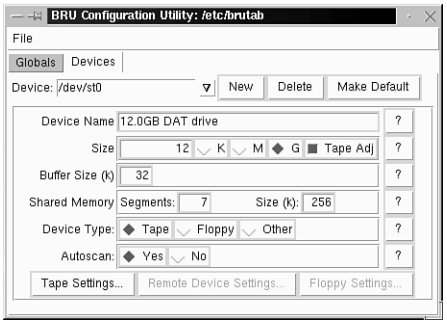
The BRU Configuration Utility features several windows, including a tape device selection list.



Click the Devices button in this window, and then click the New button. A New Device window, as shown in Figure 23.3, with a scrolling list of different devices appears.

FIGURE 23.3

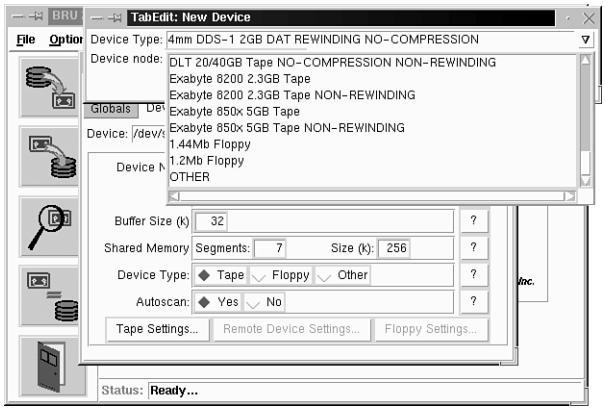
You can create new backup devices to use with BRU 2000 PE.



Click the New button to select a new device from BRU's built-in list, as shown in Figure 23.4.

FIGURE 23.4

BRU lists 37 different devices in its tape device selection list.

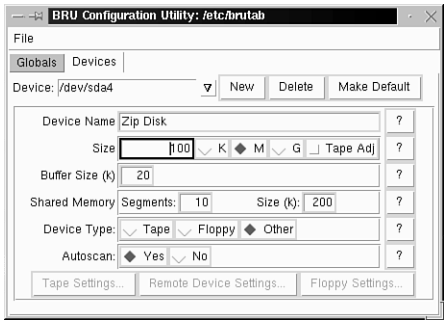


There are 37 different devices listed, including floppy drives. If you don't see a device you have in the list, select the OTHER device option to create your own. For example, if you have an older, floppy-based tape drive that uses the QIC-80 format, select OTHER and specify the tape device (most likely `/dev/rft0`, the rewinding tape device).

To create a backup device using a Zip drive, first select OTHER. After you select the backup device, type in the Zip drive's device (`/dev/sda4` for a parallel-port Zip drive). To complete your Zip backup device definition, click in the Device Name field, enter Zip Disk, then click the Size field, and enter 100 (make sure to click M to specify the size in megabytes), as shown in Figure 23.5.

FIGURE 23.5

You can create your own BRU device definition for an Iomega Zip drive backup device.


BRU Configuration Utility: /etc/brutab
File
Globals Devices
Device: /dev/sda4 New Delete Make Default
Device Name Zip Disk
Size 100 K M G Tape Adj
Buffer Size (k) 20
Shared Memory Segments: 10 Size (k): 200
Device Type: Tape Floppy Other
Autoscan: Yes No
Tape Settings... Remote Device Settings... Floppy Settings...

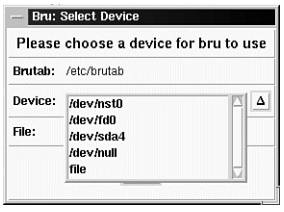
To finish the definition, click Save and Exit from the File menu items of the BRU Configuration window. To begin a backup, insert a Zip disk into your computer's Zip drive.

You don't have to mount the Zip disk with the `mount` command; BRU automatically uses the disk through the `/dev/sda4` device. If you start a backup without first inserting a Zip disk, BRU reports an error!

To start a backup, first click New Device from BRU's File menu, and then select `/dev/sda4` from the list of devices, as shown in Figure 23.6.

FIGURE 23.6

Select a backup device, such as `/dev/sda4`*, for the Zip disk before beginning backup operations.*

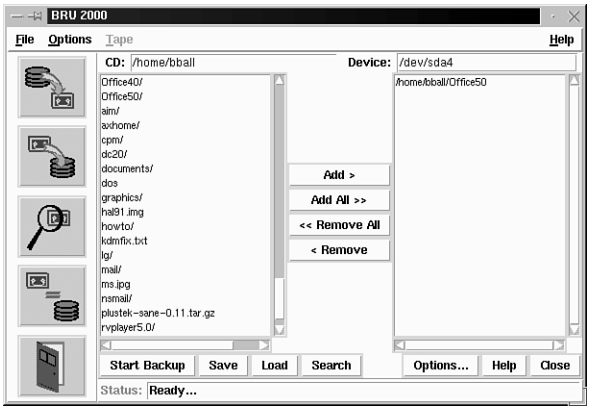


Select Backup from the BRU program's File menu, or click the top icon in the main BRU dialog box (showing an arrow going from the disks to a tape).

A file selection dialog box appears, as shown in Figure 23.7, which enables you to select whole files or directories to back up. After you finish selecting and adding the directories or files, click the Options button to select file compression or other options, or click the Begin Backup button to start your backup. BRU asks for a backup name or volume label and then starts backing up your data. If multiple volumes, or disks, are required, you're prompted to insert them when needed.

FIGURE 23.7

The BRU directory and file selection dialog box offers selective backup sets for archiving directories and files.



The BRU program has many different features, including compression, scheduling, and tape archive verification. You can find out more about this program by browsing to the following site:

`http://www.estinc.com`

Backing Up Your System with the `tar` Command

Although use of the `tar` command is discussed in Hour 5, "Manipulation and Searching Commands," as the system administrator, you need to explore some of the more complex `tar` command-line options and experiment with creating backups before implementing your backup strategy.

The `tar` command creates a tape archive. You can write the archive to your hard drive, a tape drive, or nearly any other Linux device. To create a quick backup of your users' home directories, use `tar` to create the archive as in the following example:

```
# tar cPfC users.tar / home
```

This command line creates the tape archive `users.tar` in the current directory. To save disk space, an even better approach is to use compression when creating your tape archive. The `tar` command supports `gzip` compression with the `z` command-line option. Just include `z` in the tape creation command line and revise the archive's name, like so:

```
# tar czPfC users.tar.gz / home
```

One easy way to regularly back up these directories is to save them on a different file system. If you have a DOS or Windows partition mounted (see Hour 22), automate the backup process with an `/etc/crontab` entry:

```
30 17 * * * root tar czPfC /mnt/dos/windows/desktop/users.tar.gz / home
```

Only the root operator can create or modify entries in `/etc/crontab`.

This entry, in the `/etc/crontab` file, backs up your users' directories at 5:30 p.m. each day and saves the archive in the Windows desktop folder. As you can see, automating the backup process isn't that hard and has the benefit of working in the background without your attention; this type of process is called an *unattended* backup. If you save your data on a separate file system, make sure to mount the drive before trying to restore your information. If you use compression, don't forget to include the `z` option when you restore with the `tar` command's `x`, or extract, option:

```
# cd /
# tar xzvf /mnt/dos/windows/desktop/users.tar.gz
```

These command lines restore your users' directories and files, starting at the /, or root directory. The v option lists each file as it is restored. Although backing up files to another file on your hard drive is easy, you can also use the tar command with tape drives by specifying the tape device on the tar command line.

Unfortunately, there are no utilities to format tapes under Linux. Although you must still use a DOS or Windows utility to do this, you don't have to bother with formatting if you make sure to purchase preformatted tapes.

This hour does not detail all the ins and outs of installing or using different tape devices, but it does show you the general approach and some examples you can try. To use a tape drive with the tar command, you must find the tape device under the /dev directory. There are a number of them, but I'm using the general floppy tape driver, /dev/ftape, as an example.

Although most tape drives can rewind a freshly inserted tape, you can use the mt, or magnetic tape, command to rewind or retension your tape. Insert the tape, and then use the following:

```
# mt -f /dev/ftape rewind
```

After the tape rewinds, erase it with the mt command's erase option:

```
# mt -f /dev/ftape erase
```

After the tape is erased, you can write a tar archive to the tape by specifying the /dev/ftape device:

```
# cd /
# tar cf /dev/ftape /home
```

This command creates a tape archive of all the files and directories under the /home directory. To restore your tape archive, you must use the tar command's x option:

```
# cd /
# tar xf /dev/ftape
```

There are many more options with the tar command. Explore some of them, such as the d option to test archives. For more information, see the tar manual page and read the ftape HOWTO under the /usr/doc/HOWTO directory.

Using the `cpio` Command to Backup and Restore

The `cpio`, or copy in and out, command can be used in much the same way as the `tar` command, but with several differences, especially with archive creation or extraction command-line options. For example, to create a `cpio` archive, you must use the `-o`, or create, option. The `cpio` command also requires a list of filenames, with paths, to build an archive. To do this, use the `find` command, which handily creates the required names for you.

For example, if you have a directory called `x11` that contains a number of files you want to archive, you can combine the output of the `find` command with the `cpio` command to build the archive, as follows:

```
# find x11 ¦ cpio -ov >x11.cpio
cpio: x11: truncating inode number
x11
x11/xfree86faq.txt
x11/xappsfaq.txt
x11/x11faq.txt
x11/disaster.txt
x11/XHints1.txt
1082 blocks
```

This command line shows that the `cpio` command has been fed the names of the files inside the `x11` directory, creating an archive with the `-o` option and showing you the files being added with the `-v` option. The name of the archive is `x11.cpio`, and it is created using the greater than, or `>`, redirection operator.

To restore a `cpio` archive, use the `cpio` command's `-i`, or extract, command-line option:

```
# cpio -i < x11.cpio
1082 blocks
```

This command line shows that to extract a `cpio` archive, you can use the less then, or `<`, redirection operator in conjunction with the `cpio -i` extract option. The `cpio` program recreates the directory and finishes by printing the number of 512-character blocks that were written to your hard drive.

You also can use the combination of the `find` command and `cpio` to create archives of any directory or even different files on your system. To back up all files in your directory that belong to you and have been created or modified during the current day, you can use the `find` command's `-user` and `-mtime` command-line options:

```
# find /home/bball -user bball -mtime -1 -print ¦ cpio -o >today.cpio
```

This command line creates a `cpio` archive called `today.cpio` that contains all files you've modified in the last 24 hours. You're only limited by your imagination in how to devise your backups and how to back up your system. For more information on the `cpio` command, read its manual page. For more information about the `find` command, see Hour 5, or read the `find` manual page.

Using the taper Script for Tape Drive Backups and Restores

The taper program, by Yusaf Nagree, is a backup and restore program used to create compressed or uncompressed archives of selected files or directories. This program provides a nice interface to create and maintain tape archives. You also can use other types of media to do your backups.

Using the `taper` command is easy. Specify the type of media to use with the `-T media` option. According to the latest documentation, the `taper` command supports the following options:

- `ftape`—floppy drive:tape driver that is included with your system and is used for tape drives that attach to the floppy interface
- `zftape`—more recent floppy drive tape driver that handles additional tape formats
- `scsi`—driver for tape drives using a scsi interface
- `ide`—driver to support ide tape drives
- `removeable`—driver to support floppies, or removeable hard drives

If you don't have a tape drive but would like to try the `taper` program to test a backup of a directory to floppy diskettes, use the `-T` command-line option with the removable option:

```
# taper -T removeable
```

This starts the `taper` program, as shown in Figure 23.8. `taper` uses the default removeable device, `/dev/fd0`, which is the floppy. To change the type of device to use a Zip disk, scroll down to the Change Preferences item, and press Enter. In the following dialog box, press Enter at the Tape Drive Preferences item.

In the Tape Drive Preferences dialog box, as shown in Figure 23.9, change both instances of `/dev/fd0` to `/dev/sda4`, which is the default Zip disk device. Press Esc, and return to the main menu. In the main menu, press Enter at the Backup Module item.

FIGURE 23.8

The `taper` *script provides a graphic interface for archives or backup operations of directories and files.*

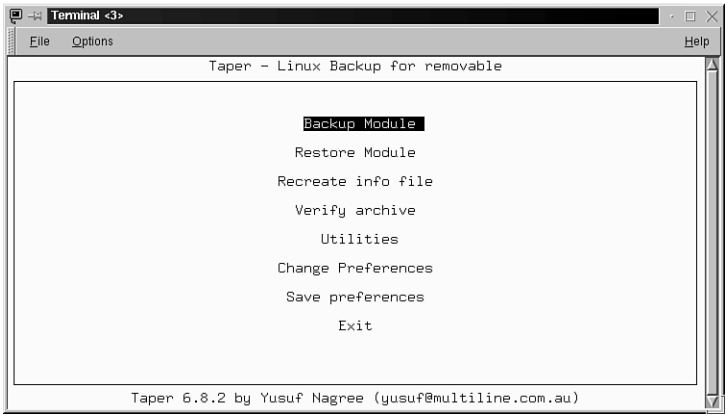
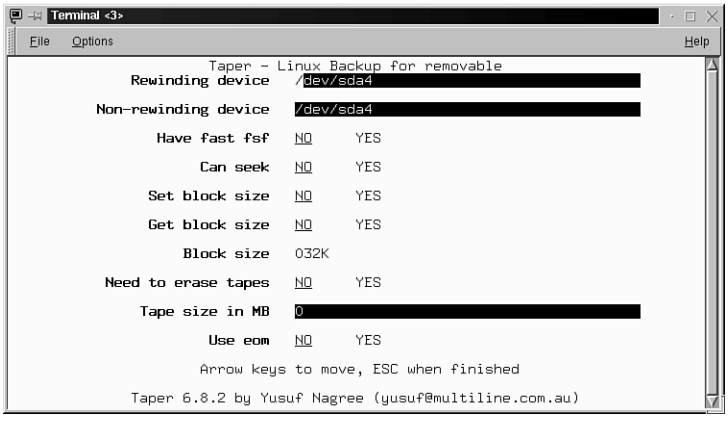


FIGURE 23.9

You can use different backup devices, such as `/dev/sda4`*, for a Zip disk during your* `taper` *backup operations.*

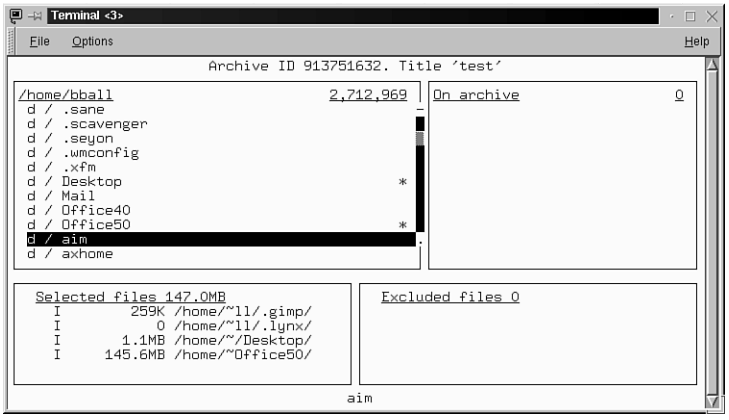

Terminal <3>
File Options Help
Taper - Linux Backup for removable
Rewinding device /dev/sda4
Non-rewinding device /dev/sda4
Have fast fsf NO YES
Can seek NO YES
Set block size NO YES
Get block size NO YES
Block size 032K
Need to erase tapes NO YES
Tape size in MB 0
Use eom NO YES
Arrow keys to move, ESC when finished
Taper 6.8.2 by Yusuf Nagree (yusuf@multiline.com.au)

In the `taper` selection dialog box, as shown in Figure 23.10, you're asked to select files or directories before you start the backup. Scroll through the list of directories and files, and select items by pressing the I key. To get help, press the H or ? keys. When you finish, press the F key to start the backup operation.

The `taper` program has many different features. Its documentation is under the `/usr/doc/taper` directory in the file `FAQ.txt`.

FIGURE 23.10

Scroll through the `taper` *selection dialog box, selecting files or directories to back up with the I key.*



Summary

This hour introduced you to different programs and ways to back up your OpenLinux system. Performing periodic backups is an important role for a system administrator, and perfecting the practice of preserving your system and important files enhances your computing experience.

Q&A

Q I don't want to use floppies to back up my system. I don't have a removeable hard drive. I also don't have a tape drive. What's the safest approach I can take to back up important files?

A You can at least back up your `/etc` directory. This directory probably contains fewer than 2.5 megabytes of files, which can be backed up to two floppy disks. Another method you can use is to back up important files to another partition (such as a mounted `msdos` or `vfat` partition). If you have the hard drive space, you can also create a small spare Linux `ext2` partition to hold periodic backups of your system's configuration files. If something happens to your root partition, you can then restore from this spare partition.

Q Help! My system has crashed! I didn't back up my files! What can I do?

A First, don't panic! You did back up your important files, right? Do you have an emergency boot disk on hand? It might be possible to recover some files by booting with the emergency boot disk and then attempting to mount your OpenLinux partitions with the boot disk's `mount` command. If your Linux partitions still exist, it might also be possible to dump the contents of a partition to a compressed file on another volume and then extract pertinent files by hand (although this is tedious and not guaranteed). Always have a boot disk with recovery utilities on hand!

Q What's the best backup medium to use?

A There are many different types of removeable media on the market today. In the last 10 years, the price and cost per megabyte (a possible yardstick) of removeable optical drives has come down quite a bit. You have to decide on a balance of cost, speed, and reliability. You already have a wonderful backup included with this book—your OpenLinux CD-ROM, which is a working archive of nearly all the software used in this book. If you carefully preserve your `/home` and `/etc` directories, you can recover from a hard drive disaster to a working system within minutes.

Exercises

1. Use the `tar` command to create a compressed archive of your `/etc` and `/home` directories. How large is the file?
2. Use the `du` command to estimate the size of your OpenLinux system. How else can you find out how much space is required?
3. Investigate ways to prepare for a hard drive disaster. If your hard drive crashes, what files do you most fear losing? What steps can you take to prevent losing these files?

HOUR 24

Using Scheduling to Automate System Management

In this hour, you'll finish by learning basic system administration skills. By now you know most of the commands used by `sysadmins` and are familiar with most of the tasks you have to perform to maintain your system for yourself or other users. This hour shows you how to put all this knowledge together in order to automate these tasks using the `cron` daemon and other OpenLinux scheduling programs.

By using the programs and techniques outlined in this hour, you can automate many different system administration jobs and maintain a healthy, well-running system. The first topic is the `cron` daemon, and then you'll learn how to administer the `at` command facilities for different users on your system.

Using the cron Daemon

The cron daemon, crond, is a program that starts after you boot Linux by the cron script in the /etc/rc.d/init.d directory on your system. This is done automatically, so you don't have to worry about starting the cron daemon every time you boot Linux. The crond program runs in the background and checks several files. The first is the crontab file in the /etc directory. A portion of this file reads as follows:

```
...
03  3  1  *  * root [ -x /usr/sbin/cronloop ] && /usr/sbin/
➥cronloop Monthly
04  4  *  *  6 root [ -x /usr/sbin/cronloop ] && /usr/sbin/
➥cronloop Weekly
05  5  *  *  * root [ -x /usr/sbin/cronloop ] && /usr/sbin/
➥cronloop Daily
42  *  *  *  * root [ -x /usr/sbin/cronloop ] && /usr/sbin/
➥cronloop Hourly
...
```

As you can see, this is a list of commands that runs tasks hourly, daily, weekly, and monthly. The cronloop command is a shell script that looks in the /etc/cron.d directory and then runs assigned tasks (in the form of shell scripts) according to files found in the Monthly, Weekly, Daily, and Hourly directories under /etc/cron.d. The actual shell scripts are found in the lib directory under the /etc/cron.d directory.

For example, if you look at the contents of the Daily directory, you find a file called 50update-locatedb that is linked to a shell script called update-locatedb in the /etc/cron.d/lib directory. This shell script, according to the preceding Daily /etc/crontab entry, builds a new database for the locate command at 5:50 a.m. each day:

```
#!/bin/bash
# Make/update the file name database

. /etc/cron.d/lib/functions

TMPDIR=$(cronloop_mk_TMPDIR)
declare -rx TMPDIR

# remove TMPDIR on exit
trap cronloop_rm_TMPDIR EXIT

OMIT="/tmp /proc /mnt /var/tmp /var/spool /dev /net /auto /amd /NetWare"

/usr/bin/updatedb --prunepaths="$OMIT" --netuser=nobody 2> /dev/null
exit 0
```

You can see that this script executes the `updatedb` command to build your system's `locate` database (see Hour 4, "Reading and Navigation Commands").

The `cron` command also searches the `/var/spool/cron` directory for personal `crontab` files with users' names. These files are created with the `crontab` command, found under the `/usr/bin` directory, and are used by your users to schedule their own regular tasks. How do you tell `cron` when to run these scripts, and how do you know that that `locatedb` script is run at 5:50 a.m. each day? Read on to see the format of the `cron` commands.

Managing User `cron` Scheduling

The `/etc/crontab` file is for scheduling regular, systemwide tasks. However, OpenLinux enables users to create their own `cron` schedules. As the root operator, if you want to enable your users to use the `crontab` command to create personal `cron` files under the `/var/spool/cron` directory, you first create two files: `/etc/cron.allow` and `/etc/cron.deny`. Under the `/etc/cron.allow` file, insert the root operator name, root, and the names of any users you want to enable access to the `cron` daemon. Because neither of these files exists in the default OpenLinux installation, all users have access to personal `cron` files. You can create files for your users with the `crontab` command, or users can create their own.

> Always use the `crontab` command's `-u` command-line option. If you run `crontab` while running as root (after using the `su` command) and don't use this option, you receive a usage error message.

The next section shows you the format of the `crontab` file and the difference between the format of a `cron` entry for your Linux system and for individual users.

Setting Schedules with the `crontab` Command

The format of `crontab` entries is detailed in the `crontab` manual page under section 5. To see the manual page, use the following:

```
# man 5 crontab
```

This page provides specifications for `crontab` entries. However, to make things simpler, I'll give you some examples and at the end of this hour, some samples you can use. In general, the fields of an entry are as follows:

```
minutes    hour    day of month    month    day of week    command
```

Entries are usually separated with a space. However, `cron` entries in the `/etc/crontab` file must have a username inserted between the day of week entry and the command. A username field is not needed for personal `crontab` entries.

For example, if you run OpenLinux on a laptop but find that OpenLinux loses time after you wake up your laptop from a battery-saving sleep, edit the `/etc/crontab` file as root, and insert a command to update OpenLinux's time every minute from the laptop's hardware clock. Use the `hwclock` commmand in your `crontab` entry like so:

```
* * * * * root /sbin/hwclock --hctosys
```

Another handy entry can be used to build the database for the `whatis` command. For example, if you know that few users are present on your system early in the morning, schedule the `makewhatis` command to run at 2 a.m. with this setting:

```
30 2 * * * root /usr/sbin/makewhatis
```

On the other hand, as a regular user, you can have OpenLinux tell you the time every 15 minutes by first calling the `crontab` command with the `-e` command-line option, and then adding the following:

```
0,15,30,45 * * * * /usr/local/bin/saytime %
```

By default, OpenLinux launches the `vim` editor when you use `crontab` with its `-e` option. See Hour 18, "Personal Productivity Tools," for a tip on how to use the `pico` editor instead.

This tells the `cron` daemon to execute the `saytime` command to speak the time every 15 minutes. You can find the `saytime` command at the following:

```
http://metalab.unc.edu/pub/Linux/apps/sound/speech/saytime.tgz
```

If you want to hear the time every minute (though it might drive you crazy!), you can use this:

```
* * * * * /usr/local/bin/saytime %
```

Note that if you don't use a carriage return at the end of the line in your entry, you should use a percent (`%`) sign.

Here are some more sample entries:

```
* 22 * * 1-4 /usr/bin/wall 'Time for bed! Finished your homework yet?' %
0 1 * * * /usr/bin/find / -xdev -name core -exec /bin/rm {} \; %
0,30 * * * /usr/bin/tput bel >/dev/console %
* 12 25 12 * /bin/echo 'Happy Holidays' ¦ /bin/mail -s Greetings root %
```

The first example broadcasts a gentle reminder to all your users using the `wall` command at 10 p.m., Monday through Thursday; the number `22` represents the hour in 24 hour format, whereas the digits `1-4` represent Monday through Thursday. The second example (probably best suited for an `/etc/crontab` entry) runs the `find` command to search your system at 1 a.m. each morning for core files and deletes any found. The third rings your terminal's bell on the hour and half hour (`0` and `30` minutes), using the `tput` command to output. The last example sends a mail message at noon on December 25th to the root operator.

The format and details of the fields in a `crontab` setting are explained in detail in Hour 18. These settings are also outlined in the `crontab` man page in section 5 of the man pages. See this man page for other sample settings.

Experiment with different tasks and times. Use OpenLinux to directly search results for files, reports of users online, and uptime reports to log files. Or use OpenLinux to email the information to you. You can also use `cron` to schedule backups when you're away or have your system shut down at a preselected time.

Managing User Scheduling with the `atrun` Command

The `cron` daemon is useful for scheduling regularly run programs or performing regular tasks, as you found out in Hour 18. The `at` command is useful for onetime or reminder jobs. Even though your Linux system is set up automatically after installation to handle user `at` scheduling requests, you should know how to manage the `at` command facilities.

By default, when a user uses the `at` command, the command is run with a default CPU priority. If too many users start running tasks with higher priorities or CPU-intensive programs in the background, your system's performance can be affected. Read on to learn to manage your system's `at` command facilities to provide the best performance and control possible.

Your system's `at` command facilities are enabled by the `cron` daemon, which, after starting when you boot Linux, checks the `/etc/crontab` file and sees the following entry:

```
...
# Run any at jobs every minute
* * * * * root [ -x /usr/sbin/atrun ] && /usr/sbin/atrun
...
```

As you can see, this is why the `at` command depends on the `cron` command: the `cron` command runs the `atrun` command, found under the `/usr/sbin` directory, each minute your system is up. The `atrun` command, in turn, searches the `/var/spool/atjobs` directory to look for jobs to run. For example, if the root operator creates a job at `14:46` for that day (2:30 p.m.), you see the following:

```
# at 14:46
at> echo Hello
at> <EOT>
warning: commands will be executed using /bin/sh
job 11 at 1998-12-14 14:46

# ls -l /var/spool/atjobs
total 1
-rwx------   1 root     root          842 Dec 14 14:43 a0000b00e85b62
```

To create an `at` command, use the word `at`, followed by a time. After you press Enter, the `at >` prompt appears. You can then enter a command and press Enter. To quit entering commands and save your job, press Ctrl+D. The `at` command then tells you the job number and the date and time the command executes. As you can see in the `atjobs` directory listing after entering the command, there is a job waiting for the root operator.

You can get more specific information about waiting `at` jobs with the `atq` command. If you're the root operator, you see all the jobs your users have scheduled, instead of just the ones you've scheduled.

Controlling the `batch` and `at` Commands

Now that you know how the `at` facilities run, how do you control how `at` works, and for whom, on your system? One way to control how `at` works on your OpenLinux system is to use the `atrun` command's `-l` (load average) option. This option controls any jobs submitted by users using the `batch` command (discussed in Hour 18 with the `at` command). You can limit when `batch` jobs are run by specifying a number lower than `1.5` (the default), which tells `atrun` to run `batch` jobs only when the system load average is low. The load average is determined by a value in the `/proc/loadavg` file while the system is running.

You can see the current load average with the following:

```
# cat /proc/loadavg
0.20 0.11 0.03 2/50 1228
```

This shows the load average for the last 5, 10, and 15 minutes. You can also get the load average by using the `uptime` command, for example:

```
# uptime
  7:40pm  up  2:44,  3 users,  load average: 0.13, 0.08, 0.02
```

To enable your users to use `batch` nearly any time, change the value of the `-l` option in the `atrun` command entry in your system's `/etc/crontab` file to a number higher than the default 1.5 value.

How do you control whether users are enabled to use the `at` command on your system? By default, after you install OpenLinux, anyone on your system can use the `at` command. There are four ways to control who can use the `at` command. Look in your `/etc` directory, and find a file called `at.deny`.

For security reasons, the `at.deny` file contains a list of OpenLinux users, including daemons or other processes, who are not enabled to use `at`. However, everyone else can use the `at` command to schedule jobs. If you want to prevent a user from using the `at` command, put the user's username in `/etc/at.deny`. If you don't want anyone on your system to use the `at` command (of course, this doesn't apply to you because you're the root operator), either create an empty `at.allow` file or delete the `at.deny` file from your `/etc` directory. If you want to enable only certain users to use the `at` command, create a file called `at.allow` in the `/etc` directory, and put the user's username in the file. If the `at.allow` and `at.deny` files are removed from the `/etc` directory, only the root operator can use the `at` command.

As a final, desperate measure to control `at` jobs as the root operator, list all `at` jobs scheduled on your system with the `atq` command, and if you see too many jobs scheduled, delete them with the `atrm` command, for example:

```
#  atq
Date                    Owner   Queue   Job#
20:00:00 11/26/97       bball   c       12
20:10:00 11/26/97       bball   c       13
20:15:00 11/26/97       bball   c       14
20:30:00 11/26/97       bball   c       15
...
# atrm 12 13 14 15 ...
```

Here, I'm assuming you see a long, long list of job numbers, and delete them. This is an abrupt, rude way to handle enthusiastic users. A better method might be to email the user to find out if there are tasks being run that can be automated during off-hour or off-peak times.

As the system administrator, you have complete control of scheduling commands for the users of your OpenLinux system. Think about tasks you should run hourly, daily, weekly, and monthly. With a little imagination, you can soon automate any custom tools, command lines, and reports you've created to help you manage your system. You can end up with more disk space, a better running system, and happier users.

Summary

This hour introduced you to a valuable skill required of all system administrators—the capability to schedule and automate complex tasks at any required date or time. This is one of the secrets to becoming a successful system administrator—to initially spend the time crafting a general-purpose approach or tool for system maintenance that can be used over and over again.

Q&A

Q **I'd like to have my computer automatically connect to the Internet during the early morning hours and then download the day's news and email the news to me. Is this possible?**

A Yes. Use the name of a shell script in your system's `crontab` file to initiate the connection, temporarily sleep, wake up, and then download and mail the news. For example, the `lynx` browser's `dump` option can be used with the `mail` command like this:

```
lynx http://some.newsource.com/news.html -dump ¦ mail
➥-s "news" root
```

Exercises

1. Create personal `crontab` settings to remind you several days in advance of important dates, such as anniversaries or birthdays. What do you think is the best way to have OpenLinux notify you?
2. Draw up a list of some important tasks to automate. How can you do this? When do you run the tasks?

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Version 2, June 1991

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Linux and the GNU system

The GNU project started 12 years ago with the goal of developing a complete free UNIX-like operating system. "Free" refers to freedom, not price; it means you are free to run, copy, distribute, study, change, and improve the software.

A UNIX-like system consists of many different programs. We found some components already available as free software—for example, X Windows and TeX. We obtained other components by helping to convince their developers to make them free—for example, the Berkeley network utilities. Other components we wrote specifically for GNU—for example, GNU Emacs, the GNU C compiler, the GNU C library, Bash, and Ghostscript. The components in this last category are "GNU software". The GNU
system consists of all three categories together.

The GNU project is not just about developing and distributing free software. The heart of the GNU project is an idea: that software should be free, and that the users' freedom is worth defending. For if people have freedom but do not value it, they will not keep it for long. In order to make freedom last, we have to teach people to value it.

The GNU project's method is that free software and the idea of users' freedom support each other. We develop GNU software, and as people encounter GNU programs or the GNU system and start to use them, they also think about the GNU idea. The software shows that the idea can work in practice. People who come to agree with the idea are likely to write additional free software. Thus, the software embodies the idea, spreads the idea, and grows from the idea.

This method was working well—until someone combined the Linux kernel with the GNU system (which still lacked a kernel), and called the combination a "Linux system."

The Linux kernel is a free UNIX-compatible kernel written by Linus Torvalds. It was not written specifically for the GNU project, but the Linux kernel and the GNU system work together well. In fact,adding Linux to the GNU system brought the system to completion: it made a free UNIX-compatible operating system available for use.

But ironically, the practice of calling it a "Linux system" undermines our method of communicating the GNU idea. At first impression, a "Linux system" sounds like something completely distinct from the "GNU system." And that is what most users think it is. Most introductions to the "Linux system" acknowledge the role played by the GNU software components. But they don't say that the system as a whole is more or less the same GNU system that the GNU project has been compiling for a decade. They don't say that the idea of a free UNIX-like system originates from the GNU project. So most users don't know these things.

This leads many of those users to identify themselves as a separate community of "Linux users", distinct from the GNU user community. They use all of the GNU software; in fact, they use almost all of the GNU system; but they don't think of themselves as GNU users, and they may not think about the GNU idea.

It leads to other problems as well—even hampering cooperation on software maintenance. Normally when users change a GNU program to make it work better on a particular system, they send the change to the maintainer of that program; then they work with the maintainer, explaining the change, arguing for it and sometimes rewriting it, to get it installed.

But people who think of themselves as "Linux users" are more likely to release a forked "Linux-only" version of the GNU program, and consider the job done. We want each and every GNU program to work "out of the box" on Linux-based systems; but if the users do not help, that goal becomes much harder to achieve.

So how should the GNU project respond? What should we do now to spread the idea that freedom for computer users is important?

We should continue to talk about the freedom to share and change software—and to teach other users to value these freedoms. If we enjoy having a free operating system, it makes sense for to think about preserving those freedoms for the long term. If we enjoy having a variety of free software, it makes sense for us to think about encouraging others to write additional free software, instead of additional proprietary software.

We should not accept the splitting of the community in two. Instead we should spread the word that "Linux systems" are variant GNU systems—that users of these systems are GNU users, and that they ought to consider the GNU philosophy which brought these systems into existence.

This article is one way of doing that. Another way is to use the terms "Linux-based GNU system" (or "GNU/Linux system" or "Lignux" for short) to refer to the combination of the Linux kernel and the GNU system.

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Bill Ball

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SECOND EDITION

SAMS
A Division of Macmillan Computer Publishing
201 West 103rd St., Indianapolis, Indiana, 46290 USA

Sams Teach Yourself Linux® in 24 Hours, Second Edition

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International Standard Book Number: 0-672-31526-2

Library of Congress Catalog Card Number: 98-88372

Printed in the United States of America

First Printing: April 1999

00 99 98 4 3 2 1

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About the Author

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Dedication

To my lovely wife Cathy for her kindness, understanding—and most importantly, killer coffee in the morning.

Acknowledgments

Thanks are due to the following people at Macmillan: Theresa Ball (for books), Lynette Quinn (for being my mentor), Tracy Williams (for finding lost contracts), Gretchen Ganser (for making me chill out), Sean Dixon (a great development editor), Jeff Koch (for the opportunities), and Eric Goldfarb (for keeping mcp.com online all the time). Special thanks to Kurt Wall—without his technical expertise, edits, and advice, I'd look like an idiot. Thanks are also due to the kind folks at Caldera Systems, Inc. and the Northern Virginia Linux Users Group, especially Gregory J. Pryzby! Thanks to Linus Torvalds for Linux, Richard M. Stallman for the GNU GPL, and Eric S. Raymond (esr) for carrying forward the Open Source Software banner. Finally, thanks to Bill Gates for making Linux more popular than ever.

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